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ERRATA

Page	12	line 25	for '1 in 50 or 60'	read '1 in 400 or 480'
	35	2	,, 'Poiterine'	,, 'Poitevine'
	83	23	insert '& Wallace (G. B.)' after 'Maxwell (Iris)'	
	123	43	for '*datisca*'	read '*datiscae*'
	148	19	,, 'root'	,, 'rot'
	150	51	,, '70'	,, '95'
	190	46	,, '*R.A.M.*, p. 174'	,, '*R.A.M.*, v, p. 174'
	191	20	,, 'Roldan (E. E.)'	,, 'Roldan (E. F.)'
	196	7	,, '*laricis*'	,, '*laricio*'
	208	28	,, '*corraloides*'	,, '*coralloides*'
		30	,, 'G. H. Hahn'	,, 'G. G. Hahn'
	227	5	,, '*Phytamatotrichum*'	,, '*Phymatotrichum*'
	228	41	,, '*gossypii*'	,, '*gossypina*'
	233	6	,, '*puberulla*'	,, '*puberula*'
	238	25	,, 'v'	,, 'iv'
	263	7	,, '*virilividum*'	,, '*viridilividum*'
	320	19	insert '*Nachrichtenbl.*' after '*Beil.*'	
	341	11	for '*cantala*'	read '*cantula*'
		39	,, '*achizopetalus*'	,, '*schizopetalus*'
	378	32	,, '*Bacterium vascularum*'	,, '*Bacterium* sp.'
	381	29	insert '*Tobacco Stat.*' before '*Bull.*'	
	398	28	for '*exalta*'	read '*exaltata*'
	399	8	,, '*areolae*'	,, '*areola*'
	441	10	,, '*halepense*'	,, '*halepensis*'
	445	49	,, 'Jochems (J. S. C.)'	,, 'Jochems (S. C. J.)'
	483	21	,, '*Coccioides*'	,, '*Coccidioides*'
	488	6	,, '*Ottia*'	,, '*Otthia*'
	523	37	,, '*hirsuta*'	,, '*villosa*'
	531	36	,, 'iv'	,, 'iii'
	548	46	,, 'Bowman (J. R.)'	,, 'Bowman (J. J.)'
	554	9	,, 'Ware (W. H.)'	,, 'Ware (W. M.)'
	570	47	,, '*endiva*'	,, '*endivia*'
	596	40	,, '*trifolii*'	,, '*alfalfae*'
	632	41	insert '& Verhoeven (W. B. L.)' after 'Botjes (J. O.)'	
	640	43	for 'v'	read 'iv'
	645	10	,, '*tabaci*'	,, '*tabacum*'
	679	12	,, '*Queckett*'	,, '*Journ. Quekett*'
	680	6	,, 'p. 38'	,, 'p. 368'
	731	39	,, '*Chalaropis*'	,, '*Chalaropsis*'
	754	2	,, '*Dyctyothyriella*'	,, '*Dictyothyriella*'
	761	34	,, 'Douin'	,, 'Dounin'
	762	31	,, '*institutiae*'	,, '*insititiae*'

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STEINMANN (A.). **Over het optreden van een nieuwe luizenschimmel bij de Thee (Nectria coccidophthora Zimmermann).** [On the occurrence of a new coccid fungus on Tea (*Nectria coccidophthora* Zimmermann).]—*De Thee*, vii, 2, pp. 49–52, 4 pl., 1926.

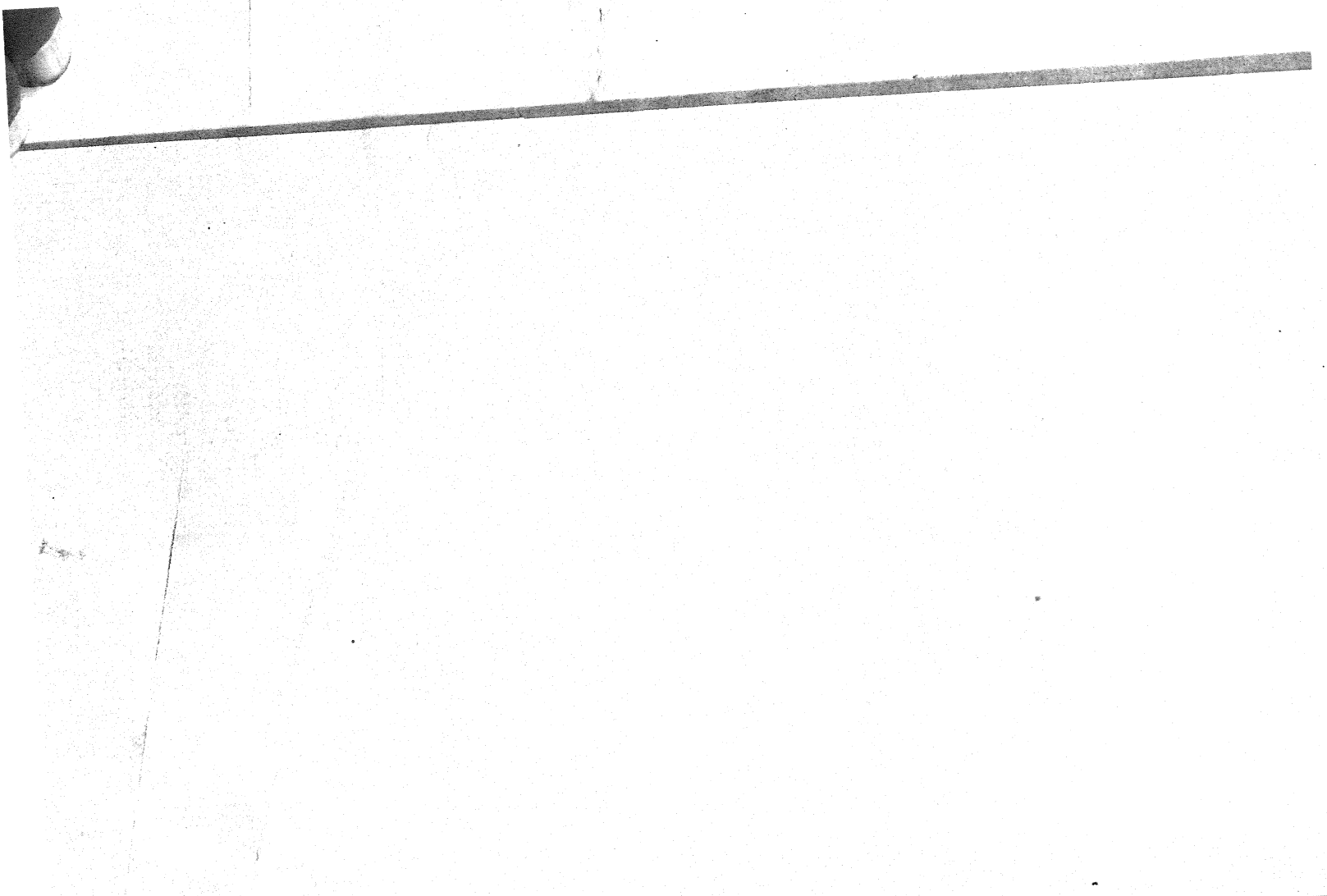
The occurrence of *Nectria coccidophthora* as a parasite of the coccids *Diaspis* and *Aspidiotus* on tea branches in Java is recorded and the microscopical characters of the fungus described. On one estate the branches were also covered with the mycelium of the grey dadap fungus, *Septobasidium bogoriense* [see next abstract].

Only in seasons which are particularly favourable to its extensive development is *N. coccidophthora* likely to act as a natural check on the insect parasites, and so far all attempts to combat the latter by means of the artificial spread of entomogenous fungi have proved fruitless.

STEINMANN (A.). **Voorloopige mededeeling omtrent het optreden van Septobasidium bogoriense en rubiginosum op Thee.** [Preliminary note on the occurrence of *Septobasidium bogoriense* and *rubiginosum* on Tea.]—*De Thee*, vii, 2, pp. 52–53, 1 pl., 1926.

Attention is drawn to the constant association in Java between the grey dadap fungus (*Septobasidium bogoriense*) [see preceding abstract] and the presence of coccids on tea, cinchona, and green cover-crops. The extensive development of the fungus during the last rainy season is attributed to the excessive drought of the previous year, which also promoted the spread of the insects.

S. rubiginosum, which was recently found on young nursery tea plants and afterwards on older bushes, and is also known to occur on *Hevea* [*brasiliensis*] and tea in Deli (Sumatra), forms a thick, chocolate-coloured to dark brownish-purple coating round the base of the stem. On some bushes clusters of reddish-brown hyphae



TUNSTALL (A. C.). **The treatment of root diseases.**—*Quart Journ. Indian Tea Assoc., 1926*, 2, pp. 45–47, 1926.

Attention is drawn to the danger of root diseases arising from dead wood left in the soil in cleared jungle land utilized for tea plantations in north-eastern India. For example, an outbreak o brown root disease (*Fomes lamaoensis*) was traced to a piece o *Mesua ferrea* root probably buried in the soil for at least fourteen years.

The complete removal of all tree roots from new clearances ha proved impracticable, but prompt action is necessary if an outbreak of root disease occurs. All killed bushes should be removed an special care should be taken to trace out the various roots of thes and to remove and burn every piece and also the original source o infection, if found, and any roots of bushes in contact with th diseased roots. The isolation of the roots of the diseased bushe from those of their neighbours by means of a trench prior t removal is only recommended in the case of comparatively lar areas of dead bushes. No chemical treatment will ever obviat the necessity of complete eradication. Liming the soil is some times an advantage in improving its physical condition and render ing it less favourable to the development of root fungi, but ther are only a few forms on which it has any direct action (e. g species of *Rosellinia*) and very frequently it produces no beneficia effect.

HARLER (C. R.). **Meteorological observations in the Dooar 1925.**—*Quart. Journ. Indian Tea Assoc., 1926*, 2, pp. 61–7 2 graphs, 1926.

The author illustrates, by examples from the tea gardens o north-eastern India, the importance of environment, especiall weather fluctuations, as a factor influencing the inception an development of plant diseases. Thread blight [*R.A.M.*, iv, p. 6 became serious in tea gardens in Assam a few years ago, but is no rare; black rot (*Corticium*) [*invisum*: *R.A.M.*, v, p. 136], prevale in 1922 and 1923, ceased to be a menace soon afterwards. Anoth species of *Corticium* (as yet unnamed) developed in epidemic for in 1924 and 1925, though it had only been observed sporadically f many years previously. The conditions favouring any disease a still obscure in most cases, though it is known that temperatur above 75° F. are fatal to blister blight (*Exobasidium vexans*), a fa which accounts largely for the periodical appearance and disappea ance of this disease.

Although the influence of meteorological conditions on th physiology of host and parasite is an important factor in dete mining the prevalence of many diseases, the importance of goo cultivation and careful pruning in strengthening the bushes so th they are able to resist attack by certain fungi always present in th soil, e. g., *Sphaerostilbe repens*, is emphasized.

A detailed analysis is made of the relation between weather co ditions and the crop of tea in various years, and an attempt is ma to indicate roughly how much of the crop variation is due meteorological changes

JOHNSON (J.), SLAGG (C. M.), & MURWIN (H. F.). **The brown root rot of Tobacco and other plants.**—*U.S. Dept. of Agric. Bull.* 1410, 29 pp., 20 figs., 1926.

The symptoms, history, and present knowledge of brown root rot of tobacco [*R.A.M.*, iv, p. 720] are described on the basis of ten years' investigations. The disease is believed to be most prevalent in the Connecticut Valley, while a similar, if not identical, condition occurs in the tobacco-growing districts of Wisconsin, Maryland, Kentucky, and elsewhere. Tomatoes, potatoes, and many legumes are also somewhat affected by the disease, the symptoms of which on the first-named host resemble those of western yellow blight [*R.A.M.*, iv, p. 639].

The experimental work here reported was mainly conducted at the Wisconsin Agricultural Experiment Station laboratories with soils from the Connecticut Valley, where the field plots were located.

The most conspicuous aerial symptoms of brown root rot, which occurs on both shade- and sun-grown tobacco of the Cuban, Havana Seed, and Connecticut Broadleaf varieties, are general stunting and temporary wilting, sometimes accompanied by yellowing, during periods of high transpiration. These symptoms are also typical of the black root rot due to *Thielavia basicola*, but those occurring on the root system are more characteristic. In severe cases the plants are easily pulled up and the few remaining roots on the base of the stalk are brown and decayed. In a moderate degree of infection there may be a considerable number of well-developed roots with distinct lesions in the top layer of the soil, but the tap-root and strong secondary roots are either absent or very feeble. The production of numerous adventitious roots is a character of both black and brown root rot. In its severe form, brown root rot is often limited to spots in the field, though sometimes entire plots may be uniformly affected.

Species of *Fusarium*, *Rhizoctonia*, *Actinomyces*, and bacteria have been isolated from diseased roots, but the results of inoculation experiments with these organisms have been consistently negative. There is thought to be a possibility that a non-culturable *Rhizoctonia* or an unknown parasite is involved, but the fact that soils exposed to desiccation and aeration in the absence of sunlight lost much of their power to produce root rot is not favourable to this hypothesis. The results of crop-rotation experiments and field observations indicate a crop relationship which contradicts an explanation based on parasitism, since it was found that the disease was worse when tobacco followed certain other crops than when it was continuously grown on the same land. In fact, the production of a diseased crop of tobacco appears to render the soil of the plot less liable to cause tobacco brown root rot in the following season. Fallowing had the same effect, which is believed, in view of the relative amount of summer cultivation given in growing the various crops, to be in some way related to the disappearance of the disease from aerated and dried soil. At the same time, no physiological or chemical theory has yet been evolved, so that the actual nature of

JOCHEMS (S. C. J.). **Rhizoctonia-ziekten op Tabak in Deli.** [*Rhizoctonia* diseases on tobacco in Deli.]—*Bull. Deli Proefstat. Medan-Sumatra* 21, 13 pp., 3 pl., 2 figs., 1926. [English summary.]

Tobacco at the Deli Experiment Station was attacked for the first time during the early part of 1925 by two strains of *Rhizoctonia*, one affecting seedlings and the other occurring on older plants.

The diseased seedlings showed a greyish-green discoloration of one or more of the leaves, accompanied by wilting and constriction of the root collar. The entire tissue is permeated by typical *Rhizoctonia* hyphae, measuring 7 to 8 μ in thickness and showing profuse septation and occasional clamp-connexions. The fungus was cultured on boiled rice and oatmeal agar: dirty white (later greyish-brown to purplish-black), irregular pseudosclerotia, 0·5 to 30 mm. in breadth, by 1·5 mm. deep, formed in three to four days on both media. Inoculations gave positive results on twenty-day-old plants, from which the causal organism was recovered and re-cultured. So far the damage caused on the one estate affected by this disease has not been serious, the infected plants rapidly recovering on thinning out.

The symptoms of infection on older plants somewhat resembled those due to the stem rot caused by *Pythium* [*R.A.M.*, iv, p. 595]. On one of the affected estates the plants had already attained their full height (20 to 30 cm.), while on the other they were only half grown. In both localities the diseased individuals showed, just below the soil, a marked constriction, 1 to 4 cm. in extent, of the stems, due to disintegration of the cortical tissue down to the wood. The stems of plants attacked only on one side bent right over and lay flat on the ground, the tops gradually resuming an erect position except in very severe cases, when the entire plant succumbed.

A strain of *Rhizoctonia*, differing in cultural and morphological characters from that described above, was isolated from diseased material. The average thickness of the hyphae was 9 μ and the pseudosclerotia were very small. Inoculation experiments were successful (to the extent of 20 per cent.) only on plants grown in soil mixed with pseudosclerotia. This type of infection was found to be closely correlated with the occurrence in the field of *Portulaca oleracea*, which suffered from attacks of the same fungus. Cross-inoculation experiments gave positive results. The spread of the disease was arrested by the eradication of the *Portulaca*, assisted probably by the advent of dry weather and the increasing maturity of the tobacco. No fresh records have been received during the dry season of 1926, and at present no particular importance need be attached to these *Rhizoctonia* diseases, which would probably be amenable to the control measures used against damping-off.

OWEN (O.). **The action of some chemical agents on Colletotrichum tabificum.**—*Eleventh Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1925*, pp. 116–118, 1926.

In this paper the author gives the results of his experiments on the

toxicity of various chemicals to sclerotia of *Colletotrichum tabificum* [*C. atramentarium*], said to be almost invariably present in glass-house soils in which tomatoes have been grown continuously for several years [*R.A.M.*, ii, p. 489 ; iv, p. 70]. Cresylic acid killed the sclerotia in 15 minutes, a saturated aqueous solution of cresylic acid in 5 hours, and an emulsified cresylic acid (8 lb. potash soap in 1 gall. cresylic acid) in 15 minutes. The emulsion, diluted to 0·3 per cent. strength, was also found to destroy the sclerotia after 17 hours' exposure. Cresylic acid vapour appeared to have no effect. Formalin (12·5 per cent.) proved effective after one hour, and phenol (0·3 per cent.), tetrachlorethane, raw fusel oil, iodine (0·10 per cent.), hydrogen peroxide (20 vol.), and paraldehyde after 17 hours.

GEORGÉVITCH (P.). **Sušenje hrastovih šuma u Slavoniji.** [The dying-off of Oaks in the forests of Slavonia.]—Vienna, 16 pp., 2 pl., 1926. [Serbian. Abs. in *Bot. Centralbl.*, N.S., viii, 3–5, pp. 146–147, 1926.]

In connexion with the phenomenal decay of the Jugo-Slavian oak forests [*R.A.M.*, v, p. 705], the writer states that, according to verbal communications from the local silvicultural authorities, the extent of the losses over the whole country is now estimated at 1,500,000 to 2,000,000 cu. m. The most severe losses occurred during the periods 1909–12, 1916–19, and 1920–23.

The injury is attributed to the rhizomorphs of *Armillaria mellea*, which are described. The hyphae eventually effect the obstruction of all the vessels and cause the death of the tree from the crown downwards.

DUFRÉNOY (J.). **Les rapports des Chatâigniers exotiques avec le milieu biologique.** [The relations between exotic Chestnuts and the biological environment.]—*Office Agric. Rég. du Massif Central, Clermont-Ferrand,* 31 pp., 25 figs., 1926.

An account is given of certain ubiquitous and potentially parasitic organisms which attack exotic chestnut trees in France under unfavourable environmental conditions.

Cytospora ambiens, common on native varieties, has been recorded in a number of cases on the dry cortex of Japanese chestnuts (*Castanea crenata*). The spores, measuring 5 to 7 by 1 μ, are borne on furcate or verticillate sporophores, 20 to 30 μ in length. The ascogenous stage of the fungus is *Valsa ambiens*, the elongated asci of which, measuring 40 to 88 by 10 to 16 μ, contain eight (sometimes four) ascospores, 16 to 18 by 3·3 μ in diameter.

Ten-year-old Japanese chestnuts, transplanted in poor soil and suffering from severe wounds inflicted during transport, showed the fructifications of *Cytodiplospora castaneae* two years later on the dry cortex at the edge of the scars. This organism was observed in a parasitic form by Ducomet in Brittany on shoots of native chestnuts [*Ann. des Épiphyties*, ii, p. 104, 1913]. It produces lesions stated to be indistinguishable from those associated with *Coryneum* (*Melanconis modonia*) [see below].

Fusicoccum castaneum was observed on the collars of some Japanese chestnuts which had been badly transplanted. The

conidia measure 6 to 9 by 1·5 to 2 μ. This is evidently the fungus observed by Ducomet as a parasite in the coppices of Finistère: The extreme variability of the fructifications in the same region of the affected cortex shows that neither their aspect nor dimensions can serve as specific characters.

It now appears certain that *Coryneum perniciosum* Bri. et Farn. is identical with *C. kunzei* var. *castanea* Sacc. (= *C. modonium* Griff. et Maubl.), names which have been given to the conidial stage of *Melanconis modonia* Tulasne. The fungus is present in all chestnut groves, its fruit bodies occurring on dying branches and also on the longitudinal lesions of the large branches and the trunks. Such lesions are frequently found on the shoots of trees four to six years after regrafting in consequence of ink disease (*Blepharospora cambivora*).

In certain cases unicellular conidia of a species of *Gloeosporium*, measuring 20 by 8 μ, have been found on lesions resembling those due to *C. perniciosum*. In the Pays Basque and Aveyron some of these fructifications may be invaded and killed by a parasitic fungus with pycnidia and small pycnospores, similar to that observed by Ducomet in Brittany on the fruit bodies of *Coryneum* (*Melanconis modonia*).

From the root of a Japanese chestnut transplanted in 1924 a species of *Phoma*, with hyphae measuring 2 μ in diameter, was isolated. On agar media the mycelium developed, at the end of a year, aggregations of dark-walled cells resembling the 'microsclerotial' form of *Verticillium dahliae* [*R.A.M.*, iv, p. 495], and having also certain analogies with *Coniothecium*. On chestnut wood the fungus produced the pycnidia of a *Phoma*.

Notes are given on the cultivation of the above-mentioned fungi, together with a brief discussion of the relations between host and parasite and of the modifications induced by infection in the metabolism of the former.

BAUDYŠ (E.). **Krankheiten und Schädlinge des Walnussbaumes.** [Diseases and pests of the Walnut tree.]—*Inst. für Hygiene der Pflanzen, Flugbl.* 14, 3 pp., Brünn, 1926. [Czech. Abs. in *Bot. Centralbl.*, N.S., viii, 3–5, p. 146, 1926.]

Walnut trees are stated to be attacked by a much greater number of diseases and pests in Czecho-Slovakia than is generally supposed. *Nectria cinnabarina* can destroy an entire tree within two to three years. *Armillaria mellea* is of constant occurrence on impermeable soils. A *Sclerotinia* causing the shedding of half-ripe fruit requires further study.

SURI (P. N.). **Trametes pini on Deodar in the Baspa Valley, Bushahr State, Punjab.**—*Indian Forester*, lii, 7, pp. 327–330, 1 pl., 1926.

Trametes pini, which is said to have been first observed on the deodar [*Cedrus libani* var. *deodara*] in India in 1910, is stated to be widespread on this host in the Lolab Valley forests (Kashmir) [*R.A.M.*, iv, p. 74] and to have appeared on it also in the Baspa Valley, Bushahr (Punjab). One deodar observed in 1925 by the writer was literally covered with sporophores, about eight of which

could be counted round the trunk at breast height, while others were visible higher up. They were of the usual irregular bracket shape, but less conspicuous than on blue pine (*Pinus longifolia*). Isolated diseased trees are known to constitute dangerous centres of infection, but the actual extent of the damage to surrounding individuals could not be gauged, since the sporophores only develop from 5 to 15 years after infection occurs.

It is now evident that *T. pini* can exist in the absence of *P. longifolia*, the above-mentioned case of infection occurring in an almost pure deodar stand, and measures to prevent the spread of the disease should be taken immediately. These should include the felling of all infected trees, the burning of diseased material, and the prohibition of lopping.

The possibility of the fungus being slightly involved in the causation of defects resembling 'shakes' in the sawn timber is very briefly discussed [loc. cit.].

SIBILIA (C.). **Due specie di 'Fusarium' parassite di piantine di conifere: Fusarium fuliginosporum n. sp. e F. echinosporum n. sp.** [Two species of *Fusarium* parasitic on conifer seedlings: *Fusarium fuliginosporum* n. sp. and *F. echinosporum* n. sp.]—*Ann. R. Ist. Sup. Agric. Forestale*, Ser. II, i, pp. 77–97, 6 figs., 1925.

During the spring of 1924 conifer seedlings (especially *Cedrus* [*libani* var.] *deodara*), in the garden attached to the Forestry Institute, Florence, were found to be attacked by a damping-off disease similar to that produced by *Pythium de Baryanum*. Two species of *Fusarium* of the *Elegans* section were isolated, that are thought to be distinct from any species hitherto recorded. The first has been named *F. fuliginosporum*, and possesses large chlamydospores with thick, smooth, brown walls, sometimes also forming bluish-black sclerotia, while the second, *F. echinosporum*, has small chlamydospores with thinner, straw-coloured, tuberculate walls. The cultural characters of both organisms are fully described and Latin diagnoses are given.

Soil treatment with a 1 per cent. solution of copper sulphate caused a marked decrease in the seedling mortality.

SIBILIA (C.). **Azione dei raggi ultravioletti e di alcuni anticrittogamici sui conidii di Fusarium.** [Action of ultra-violet rays and certain fungicides on conidia of *Fusarium*.]—*Ann. R. Ist. Sup. Agric. Forestale*, Ser. II, i, pp. 145–154, 1926. [Abs. in *Riv. Pat. Veg.*, xvi, 7–8, p. 196, 1926.]

Experiments were made to test the resistance of the conidia of the two newly recorded species of *Fusarium* described in the preceding abstract to ultra-violet rays produced by a quartz mercury vapour lamp. The destructive effect of the rays was evident in both cases.

Further experiments indicate that copper sulphate is the most effective fungicide suitable for use as a means of control. It is recommended to treat the seed-bed one month before sowing with a 3 per cent. solution at the rate of 5 to 6 litres per sq. m., repeated fifteen days later, using a 1·5 per cent. concentration, and again immediately after sowing with a 1 per cent. solution.

OVERHOLTS (L. O.). **Mycological notes for 1925.**—*Mycologia*, xviii, 4, pp. 179–184, 1 pl., 1 fig., 1926.

In these notes the following items are of phytopathological interest. The discovery by the author, in the autumn of 1925, on the leaves of *Castanea* [species not indicated] of a *Gloeosporium* indistinguishable from *G. quercinum* West. as determined by J. B. Ellis, is, as far as he is aware, the first record of this fungus on *Castanea*, if the identification of the fungus is correct.

Pinus pungens and *P. rigida* at Greenwood Furnace, Pennsylvania, suffered from a rather extensive injury of the terminal twigs of the lateral branches, caused by a species of *Crumenula* closely related to, if not identical with, *C. pinicola* (Rebent.) Karst. The injury consisted of definite though not conspicuous cankers, bearing a few black apothecia from 1 to 3 mm. in diameter, above which the distal portion of the twig was killed. The spores of the fungus are typically one-celled, occasionally two-celled, very narrow-fusoid or narrow-clavate, and 27 to 28 by 2·5 to 4 μ. The paraphyses are dichotomously forked at the tip. Superficially the apothecia are very like those of *Cenangium abietis*, from which they differ macroscopically, however, in that, when crushed in KOH, they quickly develop a conspicuous greenish-blue colour. Other pines, including *P. virginiana* and *P. strobus*, though growing indiscriminately mixed with *P. pungens*, were not attacked.

ANDREUCCI (A.). **Un nuovo Mixomicete parassita.** [A new parasitic Myxomycete.]—*Archivio Botan.*, ii, 1, pp. 18–28, 1926.

In 1921 the author observed that certain sterile branches of *Ficus repens* at Siena bore reddish tubercular swellings or tumours of a maximum diameter of 5 cm. and remaining restricted to the part on which they developed, without any signs of spread to other parts or to neighbouring plants. The smaller nodules were round and smooth, the larger irregular and coralloid. Their outer layers were corky and the inner composed of woody parenchyma and tracheids.

In fixed and stained sections of these tumours the author observed an organism which is regarded as a species of *Plasmodiophora*, and named *P. ficus-repentis* n. sp., a Latin diagnosis being given. Its life-cycle is stated to consist of spores, zoospores, myxamoebae, plasmodia, and again spores. The latter are round, 1·5 μ in diameter, with a thin, soft, hyaline wall and a small central nucleus. Zoospores were obtained when the tissues containing spores were placed in water, and are oval, pointed at one end, where a flagellum is inserted, and (including the flagellum) 2·17 μ long. The amoebae are developed from the zoospores and resemble other similar forms. They unite to form a plasmodium which divides into uninucleate particles, each of which becomes a spore.

A cystic stage was also observed, the hyaline cysts varying from 9·15 to 42·70 μ in diameter, or even, at the time of germination, up to 73 μ. They germinate by emitting a plasmodium-like body. The wall of the smaller cysts is granular, while that of the larger is much thickened and marked with fine canals.

The author's few inoculation experiments were devoid of results.

VAN OVEREEM (C.). **Dermataceae.**—*Icones Fungorum Malayensium*, xiii, 3 pp., 1 col. pl., 1926. [German.]

Encoelia helvola (Junghuhn) van Overeem, nov. comb. (= *Cenangium helvolum* (Junghuhn) Sacc.), a German diagnosis of which is given, with a historical survey and a discussion of its taxonomy and systematic position, is stated generally to occur on the nodes (occasionally in the middle of the internodes) at the base of various species of large and economically valuable bamboos, e. g., *Gigantochloa apus* and *Bambusa* spp. in the Malayan Archipelago and Brazil. The infected bamboos become worthless for structural purposes. The epidermis and underlying tissues decay completely, and numerous wide, longitudinal fissures develop, after the disappearance of the fructifications of the parasite, giving ingress to rotting organisms. The brown-walled mycelium penetrates the trunk through young adventitious roots or through wounds, and develops mainly in the scanty parenchyma of the conductive tissues, filling them with hyphae and producing a black discoloration. The thickened wall of the sclerenchymatous fibres is vertically penetrated, but not disintegrated, by numerous brown hyphae.

LAUBERT [R.]. **Einiges über den Hausschwamm.** [Notes on the dry rot fungus.]—*Mitt. Gesellsch. Vorratsschutz*, ii, 4, pp. 44–46, 1926.

A brief, popular account is given of the life-history of the dry rot fungus (*Merulius lacrymans*), with notes on its economic importance in Germany. Mention is made of the so-called 'sylvan', comparatively innocuous form of the fungus [*R.A.M.*, iv, p. 250].

JONES (F. R.). **Resistance of Peas to rootrot.**—*Phytopath.*, xvi, 7, pp. 459-465, 1926.

The present paper is a progress report of the work done in 1924 and 1925 at Madison and Columbus in Wisconsin, and at McMillan in Michigan, to establish the nature of the resistance to root rot consistently observed during several years in certain varieties of peas. Three highly resistant and three conspicuously susceptible varieties were selected for a comparative study, in the field and in the greenhouse, of their behaviour towards *Aphanomyces euteiches* [*R.A.M.*, iv, p. 580], which appeared to be the most important cause of the root rot.

In field trials in 1924 at McMillan two of the resistant varieties showed marked resistance of their roots to the invasion and progress of *A. euteiches*, but at Madison and Columbus this resistance was much less, or even absent, although the apparent resistance of the plants, as judged by their growth, was as great. In all three localities the resistant varieties remained comparatively free from fungous invasion in the vascular cylinder of the root and epicotyl, after the cortex was destroyed by *A. euteiches*, while the susceptible varieties were rapidly invaded. In a field trial at Columbus in 1925, root rot was largely prevented by drought, but the susceptible varieties were severely attacked by the wilt disease recently discovered by Linford [*R.A.M.*, v, p. 69], while the resistant varieties remained free from apparent injury.

Greenhouse trials failed to indicate any important degree of resistance to *A. euteiches* in the roots of the resistant varieties grown under such conditions.

In the light of these trials the author considers that the resistance of the peas to root rot, using the term in a general sense, as it is observed in the field, is a result of several factors. Resistance to the root rot caused by *A. euteiches* appears to be a very small factor, while in some localities resistance to wilt is a large factor. Other apparent factors are resistance to secondary invasion of roots injured by *A. euteiches*, and resistance to other root-destroying fungi of less conspicuous importance in the soil.

NEUWIRTH (F.). **Die Kräuselkrankheit der Zuckerrübe.** [The curly top disease of the Sugar Beet.]—*Rundschau, Zeitschr. für Zuckerind.* (Prague), 4, 14 pp., 1926. [Abs. in *Bot. Centralbl.*, N.S., viii, 3–5, pp. 148–149, 1926.]

The writer considers the risk of the introduction into Europe of curly top of sugar beets [*R.A.M.*, v, pp. 460, 461] from America and Australia to be very great. In Czecho-Slovakia what appears to be a similar disease is stated to be characterized by intervenous swellings accompanied by rolling of the leaf margins. This phenomenon is attributed to the sucking of the cicada *Cicadula sexnotata*, which is thought to be the vector of a similar virus to that carried by the beet leafhopper (*Euttetix tenella*) in America.

CARSNER (E.). **Resistance in Sugar Beets to curly-top.**—*U.S. Dept. of Agric. Circ.* 388, 7 pp., 4 figs., 1926.

Curly top of beets has caused serious losses in the Western States, and up to now no practical method for control of the leafhopper (*Eutettix tenella*) which spreads the disease has been discovered. Attention has therefore been directed to the development of resistant strains of beet [*R.A.M.*, v, p. 461]. The results of the experiments carried out in California reported in this paper indicate that there are definite variations among individual sugar beets in regard to susceptibility and resistance to this disease. The most resistant strain at present, however, is unsatisfactory from the standpoint of sugar content. Hybridization tests are therefore in progress with a view to combine the resistance of this strain with other desirable characters. Mass selection tests for resistance have also given encouraging results, but have not been carried very far as yet.

NEWHALL (A. G.). **The importance of controlling Celery blight in the seedbed.**—*Phytopath.*, xvi, 7, pp. 467–472, 1 fig., 1926.

Observations since 1923 in the celery fields of the western part of the State of New York have shown that both late blight of celery caused by *Septoria apii* [*R.A.M.*, iii, p. 183] and bacterial blight due to *Pseudomonas* [*Bacterium*] *apii* [*R.A.M.*, i, p. 201] are very prevalent on celery seedlings raised in the open. It was also noted that in fields planted with seedlings originating from clean seed-beds the incidence of both diseases was considerably lower than when the seedlings came from contaminated beds. Dusting experiments started in 1923 [*R.A.M.*, iv, p. 203] and continued in 1924 showed that two to four applications of 20–80 copper-lime dust

to the plants still in the seed-beds were effective in markedly reducing the subsequent development of the blights throughout the season in six out of ten fields, and in substantially increasing the resulting crops. The author considers that such dusting is a most reasonable form of insurance against both late and bacterial blights, especially against the former, the causal organism of which may persist in the soil and thus stultify the effect of seed treatment.

LEACH (J. G.) & GILBERT (H. C.). **Diseases of head Lettuce in Minnesota.**—*Minnesota Agric. Exper. Stat. Spec. Bull.*, 10 pp., 9 figs., 1926.

A brief popular account is given of the three chief fungous diseases of lettuce in the State of Minnesota, namely: drop, caused by *Sclerotinia sclerotiorum*; grey mould, caused by a species of *Botrytis*; and downy mildew, caused by *Peronospora* [*Bremia*] *lactucae*. The first two are stated to be responsible for considerable financial losses in the State. The control measures recommended include sanitation of the fields and of seed-beds, and crop rotation, a schedule for which is given.

A brief description is also given of two troubles due to weather conditions, namely, tipburn and 'shooting to seed'.

QUAINTANCE (A. L.) & SHEAR (C. L.). **Insect and fungous enemies of the Grape.**—*U.S. Dept. of Agric. Farmers' Bull.* 1220, 54 pp., 77 figs., 1926.

The etiology, symptoms, distribution, and control of the following diseases of grapes, common in the United States, are described in popular terms.

Black rot (*Guignardia bidwellii*); downy mildew (*Plasmopara viticola*); powdery mildew (*Uncinula necator*); anthracnose (*Sphaceloma ampelinum*) [or *Gloeosporium ampelophagum*]; ripe rot or bitter rot (*Glomerella cingulata*); dead arm (*Cryptosporella viticola*); crown gall (*Bacterium tumefaciens*); bitter rot (*Melanconium fuligineum*); white rot (*Coniothyrium diplodiella*); *Vibrissea* rot (*V. hypogaea*); and *Ozonium* rot (*O.* [*Phymatotrichum*] *omnivorum*).

The dropping of grapes before maturity may be attributed to unfavourable climatic and nutritional conditions [*R.A.M.*, iii, pp. 379, 700], but is most frequently associated with the so-called dead arm disease in its early stages.

Directions are given for the preparation of Bordeaux and neutral copper acetate mixtures, and the most efficient spraying and dusting apparatus and accessories are described. A schedule of combined insecticide and fungicide applications suitable for the vine is given. Thorough applications early in the season should obviate the necessity of later treatments, which frequently cause discoloration of the fruit by the spray mixture.

WOODFIN (J. C.). **Downy mildew of the Vine (Plasmopara viticola) in New Zealand.**—*New Zealand Journ. of Agric.*, xxxiii, 1, pp. 14–20, 1926.

This is stated to be the first official record of an outbreak of downy mildew of the vine (*Plasmopara viticola*) in New Zealand.

A survey of the district affected showed that the area of infection was confined within the limits of a line drawn through Swanson in the north, Manukau Harbour and Auckland City in the south, the upper Waitemata Harbour in the east, and the Tasman Sea in the west. All the vineyards and nurseries inspected in the Henderson and neighbouring districts were more or less infected, and in view of the possible further spread of the disease a brief account is given of the causal organism and of its effects on the vine. The paper terminates with a description of the usual treatment with Bordeaux mixture.

PRESTON (N. C.). **Report of the Advisory Mycologist for the period from April, 1923–March, 1926.**—*Rept. Advisory Dept. Harper Adams Agric. Coll., Newport, Salop*, i, pp. 9–14, 1926.

The following items are of interest in connexion with a three years' systematic survey of the fungous diseases of plants occurring within the West Midland Province (comprising the counties of Shropshire, Stafford, and Warwick).

Scab of apples and pears [*Venturia inaequalis* and *V. pirina*] and silver leaf of plums [*Stereum purpureum*] are stated to be very prevalent, the former having attained epidemic proportions in 1924.

The incidence of bunt of wheat [*Tilletia tritici*] has been largely reduced by growing activity in seed-grain disinfection, for which a 1 in 50 or 60 solution of formalin is recommended.

A top dressing of sulphate of ammonia has been found useful in the control of blackleg of mangolds [? *Phoma betae*: *R.A.M.*, v, p. 342].

Experiments are in progress to discover a means of control of club-root of *Brassica* spp. [*Plasmodiophora brassicae*], and a leaf spot disease of turnips and swedes, due to a species of *Cercospora*, is under investigation.

Jahresbericht der Preussischen Landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg a. d. Warthe. Jahrgang 1925–26. IV. Bericht über die Tätigkeit des Instituts für Pflanzenkrankheiten und der Hauptstelle für Pflanzenschutz für die Provinzen Grenzmark und Brandenburg rechts der Oder. [Annual Report of the Prussian Agricultural Experimental and Research Institutes at Landsberg-an-der-Warthe. Year 1925–26. IV. Report on the work of the Phytopathological Institute and of the Plant Protection Headquarters for the Provinces of Grenzmark and Brandenburg east of the Oder.]—*Landw. Jahrb.*, lxiv, *Supplement* 1, pp. 63–113, 1926.

This report has been prepared on similar lines to that for the previous year [*R.A.M.*, iv, p. 717].

For the first time a number of dusts were included in the cereal seed-grain disinfection trials [the results of which are presented in tabular form]. Uspulun trockenbeize (0·1 to 0·4 per cent.), K.E. (Koholyt, Berlin), and 1512 [*R.A.M.*, v, p. 479] proved completely useless for the control of bunt [*Tilletia tritici* and *T. levis*], while tutan (formerly 490, Saccharinfabrik, Magdeburg), hoechst (for-

merly Sch. 614) [*R.A.M.*, v, p. 729], abavit (formerly 1733, Meyer, Mainz), and a few preparations not yet on the market were very satisfactory. Tutan, however, appears to be detrimental to the germinability and vigour of the seed. Sprinkling with liquid preparations was almost uniformly inadequate. One hour's immersion in a 1 per cent. solution of monochloryl methane potassium greatly impaired germination.

Immersion for 30 minutes in a 0·1 per cent. solution of segetanneu (Degesch, Frankfurt) increased the germination of rye seed-grain infected by *Fusarium* [*Calonectria graminicola*] from 71 to 80 per cent., the corresponding figures for sprinkling with A.Z. III (Saccharinfabrik) and dusting with porzol [*R.A.M.*, v, p. 172] being 83 and 79 per cent., respectively.

Loose smut of oats [*Ustilago avenae*] was well controlled by 15 minutes' immersion in 0·1 per cent. formaldehyde and by dusting with tutan, the latter, however, occasionally exercising an injurious effect on the seed. The urania, Tr. 17 c (Agfa, Wolfen), uspulun, 125 (Saccharinfabrik), and Merck's dusts were of no value.

The adhesion of the dusts to the seed-grain caused in some cases a retardation of up to 75 per cent. in the speed of drilling.

In addition to an ordinary churn, which has given uniformly satisfactory results, the Primus dusting apparatus [*R.A.M.*, v, pp. 479, 480] proved efficient.

The acute form of phloem-necrosis characteristic of leaf roll of the potato is distinguishable from the normal disorganization due to age of the cells by a yellowish-brown discoloration and lignification, which are absent from the latter. Many contradictory statements in the current literature on leaf roll are thought to be explicable by confusion between these two forms of phloem-necrosis. Acute necrosis was not observed in tomato plants affected by leaf roll. Investigations on the metabolism of leaf roll and healthy potato plants showed that the percentage of dry matter and ash is higher in the former.

The observation that the yellow-fleshed potato varieties showed extremely severe symptoms of mosaic in the dry summer of 1925 led to the discovery that the mottling of their leaves was associated with an excessive accumulation of the yellow pigment, xanthin, the drought retarding the development of the tubers to which it normally migrates. Negative results were given by experiments in the transmission of mosaic by aphids and by the expressed sap of diseased plants. In a few cases the mosaic symptoms were communicated from infected to healthy plants by grafting.

Seven early, 17 medium early, 40 medium late, and 37 late varieties of potatoes [which are enumerated], were free, or nearly so, from *Phytophthora* [*infestans*] in 1925.

Root rot of beets [*Phoma betae, Pythium de Baryanum*, and *Aphanomyces levis*] was most severe on the Rimpau's and Strube's E varieties of sugar beet, Sperling's and Delitzsch being comparatively resistant. Among the fodder beets tested, the most severely attacked were Klein Wanzlebener E Zuckerrübe and Friedrichswerther Zuckerwalze. Five minutes' immersion in 1·5 per cent. betanal and dusting with 0·9 per cent. uspulun failed to control the disease.

As in the previous year, much damage was caused by the soil-acidity disease of cereals. Summer barley and wheat were heavily infected by loose smut [*Ustilago nuda* and *U. tritici*], leading to wholesale rejections in the case of the former crop. Criewen No. 104 winter wheat was also very susceptible.

Wart disease of potatoes [*Synchytrium endobioticum*] was observed in four new localities.

Plums suffered severe damage from the pocket-plum disease (*Taphrina*) [*pruni*].

GADD (C. H.). **Report of the Division of Mycology.**—*Administration Rept. Director of Agric., Ceylon, for 1925*, pp. D13–D15, 1926.

The following items of phytopathological interest, not already noticed in this *Review*, may be mentioned:

Leaf disease of tea (*Cercosporella theae*) caused considerable loss in the Nuwara Eliya District. The disease readily spreads from acacias in the vicinity and the use of other shade trees is under consideration.

Bud rot of coco-nut was caused at the laboratory by artificial inoculation with strains of *Phytophthora* isolated from coco-nut, areca nut [*Areca catechu*], *Hevea*, and cacao.

A species of *Phytophthora* (or *Pythium*) was isolated from *Hibiscus sabdariffa* var. *victor*. This fungus is associated with a disease which attacks the plants at the collar and then progresses upwards, killing the cortex of the stem as it goes. It also causes damping-off of the seedlings.

Splitting of the rind of mandarin oranges at the time of ripening was apparently due to heavy rains falling in May. No fungi were associated with this condition.

A species of *Rhizoctonia* resembling *R. solani* was isolated from wilted betel vines [*Piper betle*]. Inoculation tests have so far given negative results.

Other diseases recorded include those caused by *Ustilaginoidea virens* and *Piricularia oryzae* on rice and *Ramularia areola* on cotton. A species of *Rosellinia* was associated with a root disease of *Tephrosia candida*.

SMALL (W.). **Report of the Mycologist for the period January 1st to September 30th.**—*Ann. Rept. Uganda Dept. of Agric. for the year ended 31st December, 1925*, pp. 23–24, 1926.

Coffee diseases continue to be little in evidence in Uganda. *Sclerotium* [*Rhizoctonia*] *bataticola* [*R.A.M.*, v, p. 451] was found on *C. arabica* only in a few isolated cases and on roots of *C. robusta* weakened by insect injury. The host range and known distribution of this fungus were enlarged during the year; over twenty species of both woody and herbaceous plants are liable to attack. It is remarkable, however, that woody hosts such as *Grevillea robusta*, *Albizzia*, *Erythrina*, coffee, and eucalyptus can survive for a number of years before succumbing to the disease. Young cotton seedlings are frequently infected following conditions unfavourable to growth. There seems no doubt that recently imported plants are more open to infection by *R. bataticola* than either long acclimatized or indigenous forms.

Hevea rubber still remains remarkably free from fungous disease in Uganda. *Oidium* leaf mildew (? *O. heveae*) appears to be on the decrease. The Keuchenius treatment for brown bast [*R.A.M.*, iv, p. 310] is giving satisfactory results on the Government plantations, Kampala.

A high rate of mortality was recorded at times amongst cotton seedlings. Certain fungi, such as *R. bataticola*, *Fusarium udum*, *F.* sp., *Rhizopus* sp. (probably *R. nigricans*), *Alternaria* sp., and *Colletotrichum* sp. (*gloeosporioides* type) have been found on the roots and stems, but are not considered as aggressive parasites, insects being apparently the primary cause of the damage. Areolate mildew (*Ramularia areola*) was the only cotton-leaf disease in evidence, and this was only harmful during prolonged wet periods. *Colletotrichum* is frequently found on the mildewed leaves and may give rise in its turn to boll and seed disease.

Among the fungi reported during 1925 were *Helminthosporium* sp. on wheat; *Cerebella* (? *sorghi vulgaris*) on sorghum; *Sorosporium reilianum* on a wild sorghum (? *S. verticilliflorum*); *Uromyces appendiculatus* on cowpea [*Vigna sinensis*] introduced from Rhodesia; *Sclerotium rolfsii* and *Botryodiplodia theobromae* on diseased stems of *Eleusine coracana*. Fungi recorded for the first time in Uganda include *Peronospora viciae* on garden peas and *Armillaria mellea* on *Anona muricata*.

OGILVIE (L.). **Report of the Plant Pathologist for the year 1925.**—*Rept. Dept. of Agric., Bermuda, for the year 1925*, pp. 36–63, 1926.

The following are some of the chief references of phytopathological interest contained in this report:

The black tip disease of banana reported in 1924 [*R.A.M.*, iv, p. 653] was again prevalent. Further observations indicate that the diseased condition commences as an excessive gumming at the point of breaking of the perianth segments. The perianth, pistil, and stamens become black, and in moist weather are often covered with a growth of *Fusarium*. A *Fusarium* was isolated from withering flowers, and fluorescent bacteria from affected fruit, but none of these organisms was found to be pathogenic when inoculated on healthy fruit. Excess shading appears to favour the trouble, and it is recommended to keep the plants fairly open, to have the ground properly drained, to remove excessive dead leaves, to admit light to the bunch, and to remove affected fruit as far as possible. Removal of the purple bracts covering the hands as they begin to reflex and of the male flowers at the end of the stalk as soon as the latter is developed sufficiently to separate them 3 to 4 inches from the female flowers has proved beneficial and is stated to have given good results also in the Canary Islands.

Beans were badly affected by the powdery mildew (*Erysiphe polygoni*), but fairly good control was obtained by dusting with sulphur during the heat of the day.

Sclerotinia sclerotiorum caused dying-off of celery seedlings in circular patches. *Septoria petroselini* var. *apii* was prevalent throughout the season, and observations showed that the disease had been allowed to extend in the seed-beds. Dusting the young

plants during a very wet period in February was of little value, but in ordinary seasons is recommended, the extra cost of the copper-lime dust as compared with Bordeaux or Burgundy mixtures being counterbalanced by a saving in time and labour.

Musk melons [*Cucumis melo*] were severely injured by the downy mildew caused by *Peronoplasmopara* [*Pseudoperonospora*] *cubensis*.

Black rot (*Bacterium campestre*) [*Pseudomonas campestris*] was prevalent on kale throughout the season.

The lettuce crop was seriously damaged by a disease known as 'stunt', which causes losses up to 25 per cent. A *Pythium* has been isolated from the roots of diseased plants. Lettuce drop (*S. sclerotiorum*) was checked by removing infected plants along with some of the surrounding soil, watering the spaces with formalin (1 in 40), and covering them for a few days.

The Easter lily (*Lilium longiflorum* var. *harrisii*) was found to develop the black scale fungus (*Volutella* sp.) on leaves and stems killed by any agency, and the scales are thought to become infected from this source. The disease spreads rapidly in storage, causing a soft black bulb rot. Species of *Rhizopus*, *Penicillium*, and *Aspergillus* are also common on the scales and can (especially the first-named) cause marked injury to bulbs stored under unsuitable conditions. *Botrytis* blight occurred throughout the season, but was adequately controlled by spraying with Bordeaux mixture. Stump rot (*Phytophthora* sp.) [*R.A.M.*, iv, p. 480] caused serious losses in certain lily fields, spreading along the path of the drainage water. A virus disease of a serious nature, which has been termed 'yellow flat', is widely distributed, affecting in some cases over 50 per cent. of the plants. It is characterized by a pronounced downward curling of the leaves, which turn pale but are not striped or mottled, and the whole plant appears greatly dwarfed. Bulbs from diseased plants reproduce the disease in the following year. There are strong indications that the disease is transmitted by the lily aphis (*Aphis* sp. near *A. gossypii*), as is probably the case also with one of the two true mosaic diseases that affect the crop.

The value of frequent light applications of nitrate of soda in the control of pink root of onions (*Fusarium malli*) continues to be evident.

SHEPHERD (E. F. S.). **Botanical Division. Investigations on plant diseases.**—*Ann. Rept. Dept. Agric. Mauritius for the year 1925*, pp. 9–11, 1926.

This report contains the following references of phytopathological interest other than those already noticed in this *Review*.

Streak disease of sugar-cane [*R.A.M.*, v, pp. 56, 695] does not appear to be readily transmitted from diseased to healthy plants under Mauritius conditions. Smut (*Ustilago sacchari*) [*U. scitaminea*] was reported from ten estates in the drier districts. The variety D.K. 74 was the most affected. Root disease was prevalent and apparently due to a variety of causes, usually associated with defective soil conditions. In one severe attack *Fusarium* sp. was the organism most frequently found in association with the dying roots. An acute form of leaf spotting, apparently chiefly due to *Helminthosporium sacchari*, was met with on several estates.

From the diseased roots of coco-nuts [*R.A.M.*, iv, p. 668] a species of *Botryodiplodia* and a *Chaetostroma* were isolated. The disease shows no signs of spreading beyond the area enclosed by trenches.

Tobacco suffered from two forms of leaf spot, one of which is apparently non-parasitic, while the other, distinguished by large, brown, well-defined spots, is associated with both fungi and bacteria. One of the fungi present on these spots is morphologically identical with the species determined as *Basisporium gallarum*, which is known to occur on sugar-cane and coco-nut leaves.

Potatoes and tomatoes were attacked by *Phytophthora infestans*, groundnuts by a fungus resembling *Sclerotium rolfsii*, and *Calophyllum inophyllum* trees by a root disease which is spreading rapidly. A species of *Graphium*, which it is thought may be the imperfect form of a *Rosellinia*, was isolated from dying roots in the last-mentioned case. Litchi trees (*Nephelium litchi*) were weakened by infestation with the alga, *Cephaleuros mycoidea*.

DUPONT (P. R.). **Annual Report of the Seychelles Department of Agriculture for the year 1925,** 8 pp., 1926.

The following references of phytopathological interest are made on p. 5 of this report.

Bud rot (*Phytophthora palmivora*) again occurred on coco-nut, but was not worse than in previous years [*R.A.M.*, v, p. 18]. The following fungi were recorded for the first time: *Glomerella cingulata* and *Zygosporium oscheoides* on vanilla; *Eurotium herbariorum* and *Schizophyllum commune* on coco-nut; *Fomes lividus*, *Hexagonia hirta*, and *Ganoderma mastoporum* on *Casuarina*.

Entomogenous fungi are said to be doing excellent work in the control of *Lecanium* spp. and other scale insects on various plants.

LINE (C. W.). **Work connected with insect and fungous pests and their control.**—*Ann. Rept. Dept. Agric. Gambia, for the year 1925*, 52 pp., 4 pl., 1 chart, 1926.

References of phytopathological interest are scattered throughout this report.

Leaf spot disease (*Cercospora personata*) continued to be prevalent on groundnuts [*Arachis hypogaea*], but the damage was less severe than in former years [*R.A.M.*, v, p. 18]. This is attributed to the lighter and less frequent rainfall in 1925. A severe outbreak of groundnut rosette disease was reported in one district. It appears that this disease makes most headway during comparative drought. No less than 78 per cent. of the groundnut plants which germinated from seed of a healthy crop left in the ground after harvest became infected, and a decrease of over 66 per cent. in crop yield was incurred in one of the experimental plots at the Agricultural and Botanical Station. Observations tend to confirm the conclusions arrived at elsewhere [*R.A.M.*, iv, p. 648] that rosette is not transmitted by seed, soil, water, or wind, but by insects, which are evidently most active and plentiful in the Gambia during the dry season. The manner of overwintering of the virus still remains undetermined, but it is proposed to destroy all groundnut plants that come up after the harvest as a guard against the possibility of their harbouring the infection. Trials were made to ascertain

the degree of resistance of a number of varieties to both rosette and leaf spot. The 'Philippine White' has so far given the most satisfactory results in this respect.

The 'suno' [*Pennisetum typhoideum*] crop has been slightly infected by a smut, but the disease is only sporadic and affects single grains in the ear, so that the damage is very limited. Treatment of the seed with formalin has proved effective as a means of control. The green ear disease caused by *Sclerospora graminicola* is also found sporadically in this crop, but is not serious.

NEVSKI (V. P.). Средне-Азиатская Опытная Станция Защиты Растений. (Краткий отчет о деятельности за **1925** г.) [Middle Asiatic Plant Protection Experiment Station. (Brief report on its activity in 1925).]—*La Défense des Plantes*, Leningrad, iii, 2–3, pp. 248–251, 1926.

The Middle Asiatic Plant Protection Experiment Station [in Tashkent], the activity of which formerly extended over the whole of Middle Asia [*R.A.M.*, v, p. 174], was, in September, 1925, taken over by the authorities of the newly formed Uzbekistan Republic [fomerly Russian Turkestan] and renamed Uzbekskaya Plant Protection Experiment Station. The present paper gives a brief outline of the work done in 1925, most of which bore on the biology and control of insect and animal pests. The phytopathological section was chiefly concerned with the study and control of *Oidium* of the vine (*Uncinula necator*), the most dangerous and widespread disease of the crop in the region [ibid., p. 207]. Investigations were also made of the diseases of cotton, more particularly of the seedling canker [*Neocosmospora vasinfecta*: ibid., p. 175], and of a spotting of stone fruits caused by *Clasterosporium carpophilum*, which is stated to be extremely common.

RIVERA (V.). **Effet des rayons X sur les tissus végétaux normaux et pathologiques.** [Action of X-rays on normal and pathological plant tissues.]—*Ann. Inst. Pasteur*, xl, 7, pp. 614–657, 12 figs., 1926.

The author's experiments in the irradiation of *Pelargonium*, *Vicia faba*, and *Ricinus* plants are very fully described, the results being tabulated and discussed at considerable length.

Twenty-five or even twelve minutes' exposure to an apparatus in which hard rays predominate (4 MA, 180 kw., filterless, DF cm. 40) was found to effect the reduction and necrosis of the neoplasms formed by *Bacterium tumefaciens* on inoculated plants. On the other hand, exposure after inoculation to an apparatus composed of fewer or less penetrating hard rays (3 MA) for periods of 6, 12, and 25 minutes caused the development, in 66 to 111 days, of tumours of considerable dimensions [*R.A.M.*, v, p. 539]. The briefer the duration of irradiation the larger were the neoplasms thus induced.

Irradiation may be said to regulate the development of the meristematic pathological tissues, either by reduction or stimulation: in other words, it inhibits or accelerates the divisional activity of the cells composing such tissues in proportion to the intensity of the rays, and also to the specific individual radio-susceptibility of the subject and to the season.

SMITH (E. F.) & QUIRK (AGNES J.). **A Begonia immune to crown-gall: with observations on other immune or semi-immune plants.**—*Phytopath.*, xvi, 8, pp. 491–508, 5 figs., 1926.

A series of potentiometer experiments was carried out to ascertain the possible connexion between the acidity of the tissues of *Begonia lucerna* and other plants and their immunity from crown gall (*Bacterium tumefaciens*). The limiting point for growth of the latter in bouillon media and acid juices being P_H 5·70, the reason for its failure to develop in *B. lucerna* is assumed to be the excessive acidity of the tissues (almost equal to N/10 HCl). The organism grew readily when the acidity of the juice was reduced to P_H 6·56 or 7·10. The other begonias tested (*B. phyllomaniaca*, Vernon, and B.P.I. Hybrid) are all strongly acid and contain undetermined quantities of oxalic acid: they were all resistant to crown gall inoculations, but this resistance was overcome to some extent by mass action of the bacteria. This suggests that once tumours are initiated, even in very acid tissues, they will make headway in spite of the inhibiting hydrogen-ion concentration. The occurrence of natural infection on such plants is considered improbable. All the other immune or semi-immune plants, including onion, garlic, olive, pineapple, banana, sugar-cane, and agave, were found to have a juice considerably more acid than P_H 5·70, though none (except *Oxalis*) was as acid as the begonias.

PATEL (M. K.). **An improved method of isolating Pseudomonas tumefaciens Sm. and Town.**—*Phytopath.*, xvi, 8, p. 577, 1926.

The writer has found that a small amount of the bile salt, sodium taurocholate, in dextrose agar, inhibits the development of most contaminating organisms and apparently stimulates the growth of *Pseudomonas* [*Bacterium*] *tumefaciens*. The medium consists of 15 gm. powdered agar, 3 gm. sodium taurocholate, 10 gm. Witte's peptone, 20 gm. dextrose, and 2 c.c. of a 0·1 per cent. solution of crystal violet. The macerated gall material is allowed to stand in distilled water for two to twelve hours. One to two c.c. of this suspension are placed in 50 c.c. of the melted bile agar and the resulting mixture used to pour five plates which are incubated at 27° to 30° C.

Agricultural reports.—*Journ. Gold Coast Agric. & Comm. Soc.*, v, 1, pp. 44–55, 1926.

In the present reports notes are given on the work carried out in Togoland for the eradication of the collar crack organism [*Armillaria mellea*] of cacao [*R.A.M.*, iv, p. 463]. The work is stated to be greatly complicated by the large number of hosts of the fungus. Among the new hosts of economic importance recorded are *Cola* [*acuminata*], mango [*Mangifera indica*], odum [*Chlorophora excelsa*], and mahogany [*Khaya* spp.].

Work was also started in 1925, and is being prosecuted by a number of plant inspectors, for the sanitation of cacao plantations in the Gold Coast under the Plants (Injurious Pests) Act. In the Western Province the most prevalent diseases of cacao are stated to be die-back [*Botryodiplodia theobromae*], white thread [*Marasmius scandens*], and the various pod diseases [*Phytophthora faberi, Trachysphaera fructigena*, &c.].

ALLEN (RUTH F.). **A cytological study of Puccinia triticina physiologic form 11 on Little Club Wheat.**—*Journ. Agric. Res.*, xxxiii, 3, pp. 201–222, 9 pl., 1926.

The work described in detail in the present paper forms part of investigations carried out in co-operation by the Agricultural Experiment Station of the University of California and the Office of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. Its scope was the cytological study of the interaction of *Puccinia triticina* and the Little Club variety of wheat, which is fully susceptible to physiologic form XI of the rust.

Inoculation experiments showed that the fungus enters the host tissues freely; forty hours after infection only 37 out of 204 germ-tubes (about 18 per cent.) still remained outside the stomata. Two appressoria at the same stoma may become united into one, and when the two enter separately, the substomatal vesicles may fuse. In physiologic form XI the uredospore has two nuclei, the appressorium usually four, the substomatal vesicle commonly eight; the first hypha, after forming a haustorium, has six nuclei, one or two succeeding hyphae have four or five nuclei, and in all the subsequent vegetative cells there are usually three. At the onset of reproduction, the cells of the fertile hyphae become binucleate. It is suggested that the irregularities observed in the nuclear history may have some connexion with the prolonged growth of the rust in America in the absence of the aecidial host, since susceptible species of *Thalictrum* are very rare.

The invaded tissues of Little Club wheat, with the exception of the guard cells at the stoma of entry, show a minimum of disturbance or impoverishment; the cells are somewhat more turgid, and their nuclei expand and move towards the haustoria. At the period of greatest activity of the fungus, the plastids show little reduction in size and, under favourable conditions, they may be gorged with starch. Not until extreme old age of the infections do more than one or two per cent. of the host cells die.

HENNING (E.). **Är svartrosten verkligen en så farlig fiende till sädesodlingen, att Berberisbusken, som överför smittan, måste utrotas?** [Is black rust really such a formidable enemy to cereal cultivation that the Barberry bush, which transmits infection, must be eradicated?]—*Tidn. för Stockholms Läns och Stads Hushållnings-Sällskap*, pp. 213–225, August, 1926.

An account is given of the economic importance, mode of dissemination, life-history, and control of black rust of wheat [*Puccinia graminis*], and the writer's views on the subject of effective legislation for barberry [*Berberis vulgaris*] eradication in Sweden are recapitulated [*R.A.M.*, v, p. 659].

HENNING (E.). **Förslag till fälttågsplan i Berberiskriget.** [Plan of campaign in the Barberry war.]—*Landtmannen*, ix, 45, pp. 899–900, 1926.

An account is given of the writer's previous unsuccessful attempts to secure the promulgation of effective legislation against black rust

[*Puccinia graminis*: see preceding abstract] in Sweden. The law of 1918 dealing with barberry eradication is described as a half-measure, and suggestions are made for the prosecution of the campaign on a much more drastic basis. The need for the immediate prohibition of the sale of barberry plants is specially stressed.

HENNING (E.). **Berberisutrotningen som nödhjälps-arbete.** [Barberry eradication as work for the unemployed.]—*Landtmannen*, ix, 46, pp. 923–924, 1926.

The writer discusses the reasons given by the Swedish Agricultural Committee for their refusal to advise the Unemployment Commission to adopt his scheme [see preceding abstracts] for barberry eradication. The objections raised by the Committee in regard to various difficulties connected with the treatment are described as trivial, and simple methods of overcoming them are briefly outlined.

FREDERICSON (S. E.). **Berberisbusken och svartrosten.** [The Barberry and black rust.]—*Landtmannen*, ix, 46, p. 928, 1926.

Objections are raised to Henning's proposed campaign for more drastic legislation against black rust [*Puccinia graminis*] in Sweden [see preceding abstracts], on the grounds (*a*) that other factors besides the vicinity of barberry bushes are involved in the causation of epidemics; (*b*) that the salt treatment is not altogether adequate; and (*c*) that the high cost of eradication may be altogether disproportionate to the advantages arising therefrom.

HENNING (E.). **Berberisbusken och svartrosten.** [The Barberry bush and black rust.]—*Landtmannen*, ix, 47, p. 949, 1926.

The writer admits the justice of certain of Fredericson's criticisms against the proposed barberry eradication campaign [see preceding abstracts], but maintains the necessity for the latter. The history of the black rust [*Puccinia graminis*] regulations in Denmark is briefly outlined, with special reference to the appearance of the disease on the island of Møen, where barberry cultivation is permitted [*R.A.M.*, ii, p. 487].

PFEIL (K.). **Meine Erfahrungen bei der Bekämpfung des Weizensteinbrandes.** [My experiences in the control of bunt of Wheat.]—*Nachr. über Schädlingsbekämpf.*, i, 3, pp. 131–132, 1926.

The total failure of the writer's attempt at the disinfection of wheat seed-grain with 0·25 per cent. tillantin and an unspecified preparation in 1924 is ascribed to the contamination of the sacks, threshing-floor, and machinery with the spores of bunt [*Tilletia tritici* and *T. levis*]. Hence the treated grain was exposed to innumerable sources of reinfection, with the result that 25 per cent. of the crop was diseased and the yield was much reduced.

GALKOFF (V. P.). **Двухромистый натр как фунгицид и инсектицид.** [Bichromate of sodium as fungicide and insecticide.]—*La Défense des Plantes*, Leningrad, iii, 2–3, pp. 271–272, 1926.

Bichromate of sodium was shown in preliminary tests made in

1925 to be an effective fungicide and insecticide, and a fairly active poison for small rodents. Its fungicidal properties are exemplified by the results obtained in experiments with spores of wheat bunt, *Tilletia tritici*, the germinability of which was reduced from 50 per cent. in the control to 10 per cent. by 5 minutes' treatment and to 6 per cent. by 15 minutes' treatment with a 0·5 per cent. solution; and to 12 per cent. by 5 minutes' treatment and 10 per cent. by 15 minutes' treatment with a 0·25 per cent. solution. Its action on wheat seed-grain was: 88·2 per cent. germination in the control, 86 per cent. in the seed treated for 15 minutes with a 0·5 per cent. solution, and 87·7 per cent. in that treated for 5 minutes with a 0·25 per cent. solution. Seed treated for 5 minutes with a 0·5 per cent. solution produced no bunted ears, while the incidence of the disease in the plants raised from the control was 5·1 per cent. An advantage of bichromate of sodium is its great solubility both in cold and warm water.

RICHARDS (B. L.) & BRACKEN (A. F.). **Control of stinking smut of Wheat with copper carbonate.**—*Utah Agric. Exper. Stat. Circ.* 59, 8 pp., 1 fig., 1 diag., 1926.

In 1925 the losses caused by bunt [*Tilletia levis*] to the Utah wheat crop ranged from 25 to 50 per cent., while 30 per cent. of the wheat seed-grain tested was found to be infected. A brief, popular description is given of the disease, with directions for its control by dusting with copper carbonate.

ODRY (P.). **Őszi-és tavaszi buzacsávázási kisérletek különböző csávázószerekkel.** [Wheat disinfection experiments with winter and spring Wheats and various fungicides.]—*Növényvédelem.*, i, 7, 1925. [Abs. in *Fortschr. der Landw.*, i, 17, p. 550, 1926.]

Excellent results were obtained in Hungary in 1924 and 1925 in the control of bunt [*Tilletia tritici* and *T. levis*] on winter and spring wheat seed-grain by disinfection with porzol [*R.A.M.*, v, p. 172]. This preparation should form a valuable popular substitute for copper sulphate on account of facility of application.

BODNÁR (J.). **A Höchst-féle 'Kusperit' porcsávázó szer laboratoriumi vizsgálata.** [Laboratory test of the Höchst dust 'kusperit'.]—*Növényvédelem.*, i, 6, 1925. [Abs. in *Fortschr. der Landw.*, i, 17, p. 550, 1926.]

Wheat seed-grain treated in Hungary with 0·2 to 0·4 per cent. kusperit was not adversely affected either as regards germinability or germinative energy. The bunt [*Tilletia tritici* and *T. levis*] spores mixed with the dust lost their viability. Kusperit can be recommended on the basis of these tests as an effective seed disinfectant dust.

BODNÁR (J.). **Uspulun csávázási kisérletek.** [Disinfection experiments with uspulun.]—*Növényvédelem.*, ii, 2, 1926. [Abs. in *Fortschr. der Landw.*, i, 17, p. 550, 1926.]

In laboratory tests in Hungary the germination of wheat seed-grain was not impaired by treatment with the prescribed 0·5 per cent. uspulun solution, while no injurious results followed the use

even of as high a concentration as 2 per cent. The development of the treated wheat was frequently observed to be more vigorous than that of the controls. Bunt [*Tilletia tritici* and *T. levis*] spores were destroyed by the 0·5 and 0·25 per cent. solutions, and in field experiments the crop from heavily infected treated seed remained completely healthy.

Loose smut of oats [*Ustilago avenae*] is stated to be controllable by one hour's immersion in 0·4 per cent. uspulun, which has also been found effective against *U. hordei* on barley.

Healthy and diseased beans (infected by *Gloeosporium*) [*Colletotrichum lindemuthianum*] were immersed for 30 minutes in water or 0·25 per cent. uspulun. The latter stimulated the growth of the healthy material and reduced the incidence of infection in the diseased lot from between 20 and 30 per cent. to nil.

BODNÁR (J.). **'Germisan' csávázási kisérletek buzaköüszög és zabporüszög.** [Disinfection tests with germisan against bunt of Wheat and loose smut of Oats.]—*Növényvédelem.*, ii, 3, 1926. [Abs. in *Fortschr. der Landw.*, i, 17, p. 550, 1926.]

Germisan exercised no adverse effect on the germination of treated wheat and oats in the writer's experiments in Hungary. Wheat bunt [*Tilletia tritici* and *T. levis*] and loose smut of oats [*Ustilago avenae*] were completely eliminated by treatment with a 0·25 or 0·125 per cent. solution. In field tests it was shown that half an hour's immersion in 0·25 per cent. germisan affords complete protection against bunt of wheat and loose smut of oats.

JONES (J. S.) & MITCHELL (G. A.). **The cause and control of yellow berry in Turkey Wheat grown under dry-farming conditions.** —*Journ. Agric. Res.*, xxxiii, 3, pp. 281–292, 2 figs., 6 graphs, 1926.

Yellow berry is a diseased condition of hard wheat grains characterized by a mottled appearance and lack of hardness of the grains, which are also poorer in protein than normal ones. In the authors' opinion it is a manifestation of nutritional disturbances resulting from insufficiency of nitrogen and other elements of plant food in the soil. It appears to be most prevalent in dry-farming regions, such as the central Columbia River basin, where the rainfall is between 12 and 13 inches. Experiments made at Moro, Oregon, showed that the trouble may be minimized by a thorough summer fallow tillage, involving autumn or early spring disking before ploughing, reasonably early spring ploughing, and cultivation with harrow and weeder to keep the surface soil loose and clean of weeds. It is not believed, however, that this control of the trouble can be maintained indefinitely, no matter how thorough the tillage may be, unless means are found to preserve dry-farmed lands from the gradual depletion of their native supply of nitrogen.

BECK (OLGA). **Infektionsversuche mit dem gedeckten Gerstenbrand (Ustilago hordei [Pers.] Kell. and Sw.).** [Inoculation experiments with covered smut of Barley (*Ustilago hordei* [Pers.] Kell. and Sw.).]—*Fortschr. der Landw.*, i, 17, pp. 540–543, 1926.

After a number of unsuccessful attempts at the artificial inocula-

tion of barley seed with the spores of covered smut (*Ustilago hordei*), the writer undertook a series of tests in the spring of 1925, part of the seed being previously dehulled according to Tisdale's method [*R.A.M.*, iii, p. 330]. The inoculum and the seed-grain were procured from a heavily infected Carinthian crop. The seed was sown in pots in the greenhouse on 30th March and transferred to the field on 15th April.

In eight of the 24 plots the inoculum was mixed with the soil, but infection (5 per cent.) resulted in only one. In the remaining plots positive results were obtained only with dehulled seed, and the highest percentage of infection was 41. These results do not approximate to those secured by Faris with whole seed [ibid., iii, p. 448], much less to Tisdale's with dehulled material. Considering that the incidence of field infection in the United States may amount to 30 or 50 per cent., it would seem probable that the American strains of the fungus are more closely adapted to their host than those occurring in Germany, where natural infection never exceeds a relatively low figure.

The failure to secure infection on whole seed-grain in the laboratory, whereas the disease is constantly observed in small amounts in the field, is explained by the fact that in the former case the seed is treated by hand and therefore remains intact, while in the latter it is frequently damaged by threshing operations.

MOLZ (E.). **Versuche zur Bekämpfung des Hartbrandes der Gerste mittels Trockenbeize.** [Experiments in the control of covered smut of Barley by means of dusts.]—*Deutsche Landw. Presse*, liii, 27, p. 340, 1926.

Covered smut of barley (*Ustilago hordei*) is stated to cause somewhat greater damage in Germany than loose smut (*U. nuda*), the average incidence of the former being estimated at 5 per cent., while that of the latter seldom exceeds 2 per cent. Brief directions are given for the differentiation of the two diseases by external symptoms and mode of infection [*R.A.M.*, v, p. 604]. In a recent series of experiments in the control of covered smut on winter barley, abavit B dust (100 gm. per cwt. seed-grain), agfa dust Tr. 331 (200 gm. per cwt.), and one hours' immersion in 0·25 per cent. germisan reduced the incidence of infection from 55·5 per cent. to nil. The corresponding figures for the dusts hiag III (100 gm.), agfa Tr. 334 (200 gm.), and segetan P. 309 (200 gm.) were 3·5, 1·5, and 2·5 per cent., respectively. These results are regarded as very promising, especially in the case of abavit B, owing to the smallness of the quantity requisite for complete control.

MOLZ (E.). **Neue Erfahrungen mit der Trockenbeize des Saatgutes.** [New experiences in the dusting of seed-grain.]—*Deutsche Landw. Presse*, liii, 34, pp. 425–426, 1926.

In continuation of the report on the successful control of covered smut of barley [*Ustilago hordei*] by dusting [see preceding abstract], the results of further experiments at the Halle Phytopathological Experiment Station are described.

Bunt of wheat [*Tilletia tritici* and *T. levis*] was completely eliminated by abavit dust in two lots of winter wheat showing 59·7

and 50·2 per cent. infection, respectively, in the untreated controls. Similar data were obtained at the Delitzsch Agricultural College, where the incidence of bunt was reduced from 55 per cent. to nil by treatment with abavit, abavit B, or tutan. In the Halle tests bunt was also adequately controlled by tutan, segetan, agfa, and höchst dusts.

Abavit B was the only commercial preparation giving good results against loose smut of oats [*Ustilago avenae*], a marked stimulus to growth being also observed on some of the treated plots.

Stripe disease of barley [*Helminthosporium gramineum*] was successfully combated by höchst, tutan, abavit B, and agfa.

Abavit B was the only preparation suitable for the disinfection of peas.

Dusted seed-grain may safely be stored for several months in a dry place, but even three days' storage in a humid atmosphere involves a serious reduction of germination in certain cases.

The writer recommends the use of the so-called 'double steep' corbin [but see *R.A.M.*, iv, p. 759] as a sequel to dusting for protection against the depredations of birds.

The Primus A and B and the Beizsack Halle apparatus [ibid., v, 479, 480] have all proved satisfactory for dusting the seed.

Referring to the impossibility of controlling loose smut of wheat and of barley [*U. tritici* and *U. nuda*] by chemical means, the writer points out that the damage caused by these diseases is negligible (seldom amounting to more than 2 per cent.) in comparison with that resulting from bunt of wheat, loose smut of oats, and stripe disease of barley. Of these, the first-named may cause 90 per cent. infection, the second 30 per cent., while the third is liable to reduce the yield by 30 to 50 per cent.

It has been estimated by the Bavarian plant protection authorities that the systematic disinfection of seed-grain would increase the value of the German harvest by 900,000,000 gold marks. In the winter of 1923–4 it was necessary to plough up 1,500,000 acres of rye in Prussia alone, largely as the result of *Fusarium* disease [*Calonectria graminicola*: see also *R.A.M.*, v, p. 85], while the value of the crop over the remaining area was reduced by 12·3 per cent., the corresponding figure for the diminution in the value of the wheat crop on account of disease being 16·8 per cent. In view of these facts, the need for steeping cannot be too strongly urged, and the use of dusts can now be unhesitatingly recommended. The treatment of rye seed-grain against *C. graminicola* is stated to be particularly necessary this year, since infection is already rife as a result of the wet season and of the prevalence of lodging.

LINDFORS (T.). **Om betning av höstutsädet.** [On the disinfection of autumn seed-grain.]—*Landtmannen*, ix, 32, pp. 628–629, 1 fig., 1926.

The results of the writer's recent experiments in Sweden in the control of fungous diseases of cereals by seed-grain disinfection are briefly described. In one test with rye which was only slightly infected by the snow mould (*Fusarium*) [*Calonectria graminicola*],

the average increase of yield in the disinfected plots was 600 kg. of grain per hect. The best control of the disease in years of severe infection appears to be given by germisan, while uspulun is effective in milder cases. Corrosive sublimate has long proved satisfactory and is the cheapest of the mercurial preparations. Tillantin has also given good control in preliminary tests. Among the dusts tested against *C. graminicola*, agfa, tutan, and uspulun were more efficacious than höchst, rex, or Merck, and fully equal to the standard liquid treatments.

Bunt of wheat [*Tilletia tritici* and *T. levis*] can be absolutely controlled by germisan, tillantin, uspulun, or vetefusariol. Uspulun, rex, and höchst dusts also gave good results, while Merck was unsatisfactory. Uspulun and tutan gave the most marked stimulus to development.

GISEVIUS & STRAIB. **Zur Bekämpfung der Streifenkrankheit der Gerste, insbesondere durch die Trockenbeize.** [On the control of stripe disease of Barley, especially by dusting.]—*Deutsche Landw. Presse*, liii, 32, pp. 398–399, 1926.

The incidence of stripe disease of barley (*Helminthosporium gramineum*) is stated to vary considerably in different parts of Germany. Thus Noack observed heavy infection for a number of years on the right bank of the Rhine, between the Neckar and the Main, whereas in Rhenish Hesse, where barley is extensively cultivated, the disease is less in evidence.

Varietal susceptibility to stripe disease is also very marked. Of 18 summer barley varieties tested at Giessen in 1926, Ackermann's Isaria showed fairly heavy infection (5 to 7 per cent.); 1 per cent. occurred on Pflug's Intensiv, Hörning's Sommer, Zeiner's Franken, and Oppin Hanna; while Mittlau, Mahndorf, Friedrich's, and Rimpau's Hanna, Heine's Goldthorpe, and Bethge's II were immune. Contrary to Kölpin Ravn's observation (*Zeitschr. für Pflanzenkrankh.*, xi, p. 24, [1901]) that the *erectum* type of barley is chiefly attacked, all the above-mentioned varieties belong to the *nutans* group.

In an experiment primarily designed to test the stimulatory effect of various disinfectants on the highly susceptible Ackermann's Bavaria variety, complete or nearly complete control of stripe disease was obtained by one hour's immersion in 0·25 per cent. germisan or tillantin at 18° C., and by dusting with höchst or tutan at the rate of 4 gm. per kg. of seed-grain. One hour's immersion in water at 18° and dusting with abavit B (4 gm. per kg.) failed to eliminate infection. The actual infection percentages for the various plots were as follows: control 54, water 75·7, germisan 0·6, tillantin 0, höchst 0·6, tutan 0, and abavit B 14·7. Neither höchst nor tutan impairs germination, and both possess the additional advantages of simultaneous efficacy against *Fusarium heterosporum*, with which the seed-grain was heavily infected.

Leaf spot (*Helminthosporium teres*), which also occurred on the experimental plots, was not found to be amenable to the treatments applied against stripe disease, but the former is of little economic importance. The five- to six-septate, elongated, ellipsoid conidia of *H. gramineum* are quite distinct from those of *H. teres*, which

are bi- or at the most tri-septate, tapering at one end and rounded and slightly curved at the other.

LEUKEL (R. W.), DICKSON (J. G.), & JOHNSON (A. G.). **Seed treatment experiments for controlling stripe disease of Barley.**—*Phytopath.*, xvi, 8, pp. 565–576, 1926.

In continuance of their previous experiments on the control of stripe disease of barley (*Helminthosporium gramineum*) by seed treatment (*Phytopath.*, xiv, p. 42, 1924), the writers undertook a further extensive series of tests in the spring of 1925 with the following compounds. A (liquid). Uspulun; Bayer compound (a hydroxymercurinitrophenol compound manufactured by the Bayer Co., Inc., New York City); germisan; S.F.A. Nos. 125 and 175 (Saccharinfabrik, Magdeburg); semesan; corona Nos. 620 and 640, the former a mercurated orthonitrophenol and the latter a mercurated acetaldehyde preparation (Corona Chem. Div. Pittsburgh Plate Glass Co., Milwaukee, Wisconsin); and tillantin C (H. A. Metz & Co., Inc., New York City). B (dusts). Uspulun bolus; Bayer No. 3; S.F.A. No. 225; semesan and semesan jr.; and copper stearate (Pittsburgh Plate Glass Co.). The treatments [the technique of which is briefly described] were applied to Wisconsin Pedigree No. 6 barley seed-grain at the Arlington Experiment Farm, Virginia. All the liquid preparations were used at concentrations of 0·25, 0·5, and 1 per cent. for periods of one and two hours' immersion.

The results of the experiments [which are presented in tabular form] showed that the greatest reduction in the germination percentage of the seed was produced, in the liquid preparations, by corona No. 620, followed by S.F.A. No. 175 and tillantin C (1 per cent. for two hours). The uspulun-treated seed showed the highest average percentage of germination throughout and produced the highest yield, while infection was reduced to a trace. Semesan and Bayer compound were almost equal to uspulun in these respects. Germisan completely eliminated stripe disease, but failed to improve germination or to increase the yield.

The dusts apparently exercised no effect on the germination of the seed, but all decreased the incidence of infection to some extent, while S.F.A. No. 225, semesan jr., and semesan, the three best, reduced it from 20 and 17 per cent. in the controls to 0·3, 2, and 4 per cent., respectively. The efficacy of the dust treatments is thought to depend largely on the amount of moisture in the soil at sowing time.

KRAMPE (O.). **Fusarium als Erreger von Fusskrankheiten am Getreide.** [*Fusarium* as the cause of foot rots of cereals.]—*Angew. Bot.*, viii, 4, pp. 217–261, 4 pl., 1926.

The writer isolated the following species of *Fusarium* from cereals affected by foot rot in various parts of Germany and Switzerland in 1924: *Calonectria graminicola*, *F. avenaceum*, *F. aurantiacum*, *F. anthophilum*, and *F. culmorum* from rye; *C. graminicola* var. *neglecta*, *F. culmorum*, *F. sclerotium*, *F. herbarum*, and *F. herbarum* var. *pirinum* from wheat; *F. aurantiacum* and *F. equiseti* from barley; and *F. culmorum* from oats.

C. graminicola var. *neglecta* n. var., which was isolated from wheat received from Zürich, differs from *C. graminicola* chiefly in its conidial dimensions. The uniseptate conidia measure 16·8 by 4·9 μ and the 7-septate 29·3 by 5·7 μ, while the triseptate (representing 48 to 50 per cent. of the total number examined) are 26·1 by 5·3 μ. The perithecial stage developed on oatmeal agar, rice, barley ears, potato tubers, and lupin stalks, but was not observed in nature.

In a series of inoculation experiments to test the comparative pathogenicity of *C. graminicola* and its new variety, the losses from the former through seed infection amounted to 64 per cent. for rye and 73 per cent. for barley, the corresponding figures for *C. graminicola* var. *neglecta* being 68 and 57 per cent., respectively. Rye and barley were infected to the extent of 69 and 68 per cent., respectively, through soil inoculation with *C. graminicola*, while the new variety produced 62 and 58 per cent. infection by the same method. Wheat and oats were not attacked by *C. graminicola* var. *neglecta*.

Of the above-mentioned organisms, *F. culmorum*, *F. avenaceum*, *F. herbarum*, *F. equiseti*, and *F. aurantiacum* also proved pathogenic to all the cereals used in the tests, the heaviest damage to wheat being caused by *F. culmorum* (82 per cent.); to barley by *F. herbarum* and *F. avenaceum* (100 and 95 per cent., respectively); to oats by *F. herbarum* (74 per cent.); and to rye by *F. aurantiacum* and *F. herbarum* (96 and 92 per cent., respectively). It is apparent from these figures and other data that barley and rye are most susceptible to the foot rot caused by these fungi and wheat least so. *F. culmorum* is the most virulent of the causal organisms, followed by *F. avenaceum* and *F. herbarum* [*R.A.M.*, iv, p. 161]. *C. graminicola* caused relatively little damage, especially to wheat (only 11 per cent.).

No differences in pathogenicity were observed to result from the choice of special culture media for the growth of the various causal organisms, provided development was normal. In cultures on various media the normal fructification of *F. culmorum* lasted well over 100 days, while in the other species the conidia began to assume abnormal forms after three to four weeks.

The writer's experiments showed that foot rot may arise either from the use of diseased seed or through soil infection. The mycelium occurs only in the pericarp of infected seed; penetration into the healthy endosperm and embryo was not observed, nor did the seedlings become diseased from internal infection derived from the seed. The radicle and shoot become infected as they develop, from external mycelium surrounding the seed coats. In all the species of *Fusarium* tested, even where diseased seed was used, foot rot developed as a typical seedling infection proceeding from without and was not the result of an internal mycelium. In its subsequent course the mycelium develops mainly in the peripheral cortical layers of diseased plants, penetrating the vascular tissues only in the case of *F. aurantiacum*. *F. avenaceum* and *F. equiseti* also attack the roots of older plants to a considerable extent.

The damage caused by the species of *Fusarium* discussed in this paper consists mainly in the local destruction of the cortical tissues

at the base of the plant. Affected individuals may survive, but seldom yield normal seed.

The morphological and cultural characters of all the species referred to are described, and there is also a table giving a list of fungi with a *Fusarium* conidial form that have been recorded as attacking the various cereals, together with their synonymy. A bibliography of 99 titles is appended.

MANSHARD (E.). **Zur Bekämpfung der Dörrfleckenkrankheit des Hafers durch Mangansulfat.** [On the control of grey speck disease of Oats by manganese sulphate.]—*Illus. Landw. Zeit.*, xlvi, 33, p. 424, 2 figs. (p. 422), 1926.

Good control of grey speck of oats has been obtained at Halstenbek (Holstein) by the application of manganese sulphate at the rate of 100 kg. per hect. The hydrogen-ion concentration of the soil in the diseased plots ranged from P_H 7·0 to 7·4, compared with 6·2 in healthy ones. Thus even a slight excess of alkalinity apparently suffices to disturb the equilibrium and consequently to affect the metabolism of the oats [*R.A.M.*, v, p. 732]. Allusion is made to the high cost of manganese sulphate (50 to 100 RM. per 100 kg.) and to the difficulty frequently experienced in obtaining it.

LUDWIGS [K.]. **Pflege des Getreides während der Lagerung.** [Care of cereals during storage.]—*Mitt. Gesellsch. Vorratsschutz*, ii, 5, pp. 47–50, 1926.

Brief popular notes are given on some of the fungous contaminations to which stored cereal grain is liable in Germany, with special reference to those likely to occur as a result of the wet summer of 1926. Reference is also made to some diseases in the crop which affect the value of the grain for milling purposes.

Ergot of rye (*Claviceps purpurea*) is stated to be markedly decreasing in Germany, and the writer knows of no case during recent years in which certification was refused on this account.

Bunt (*Tilletia tritici*), which is stated frequently to occur to the extent of 60 per cent. on small farms, greatly impairs the quality of the flour made from infected wheat. The certification regulations in connexion with this disease are very stringent, the occurrence of one infected plant in 100 paces involving rejection of the entire crop.

Directions are given for the prevention of a musty flavour in flour (due to infection of the grain by various moulds, e. g., *Aspergillus glaucus*, *Penicillium glaucum*, and the like) by the admixture with the grain of finely chopped chaff, calcined lime (1 hectol. per 50 hectol. of grain), charcoal (0·5 l. per hectol. grain), or a mixture of calcined lime and sodium bicarbonate (350 and 50 kg., respectively, per 10 tons of grain).

BRIGHT (T. B.). **The microscopical examination of damaged Cotton hairs by the Congo red test and the swelling test of Fleming and Thaysen.**—*Journ. Text. Inst.*, xvii, 8, pp. T396–T404, 4 pl., 1926.

Infection of cotton hairs by certain micro-organisms, and the consequent modifications of structure, frequently resulting in

deterioration of the hair, has recently been the subject of close investigation. The only method which has so far been developed to reveal such modifications is the swelling test of Fleming and Thaysen [*R.A.M.*, iii, p. 37]. In the present paper, the efficacy of this method is compared with that obtained by the use of Congo red following swelling with sodium hydroxide, a method which has been found to stain the hair more intensely where the cuticle has been ruptured or detached. A description is given of the application of the latter method in determining microscopically damage in a Sakel cotton caused either by heat, by mechanical means, by the action of a fungus, or by the action of acids.

Cotton which had been sterilized and inoculated with spores of *Aspergillus niger* showed, after treatment with Congo red, evidence of damage to all the hairs, which in some places were stained evenly red, and in others were covered with multiple spiral bands, similar to those produced by exposure to a temperature of 150° C. but quite different from the effects of mechanical damage. Cracks and abrasions were absent. In the case, however, of a lumen-invading fungus (not yet identified), the hairs were stained throughout, broken up into short lengths, and covered with cracks and abrasions. In the swelling test without staining, hairs that had been exposed to the action of *A. niger* swelled evenly and without forming beads, but the spiral band formation was produced in the same way as in the previous test. With the lumen-invading fungus, surface damage was widespread and the injuries of the hairs resembled closely those produced by grinding. It is, therefore, advisable to use the swelling test only on cotton known to be practically free from mechanical damage.

During an examination of samples of yarn and of grey cloth for mildew damage, the penetration of isolated hairs by hyphae was observed, without any trace of fungi outside the hair, or elsewhere in the yarn. Infection apparently must have occurred, in such cases, either in the field or bale, and the hair have been separated from the bulk of the infected cotton in the spinning redistribution process. Inoculations with pure cultures indicate that the habit of invading the lumen in the early stages of attack is a characteristic of certain fungi only, a notable case being *A. niger*. Ability to penetrate the wall of an undamaged hair is doubtful even in this case. As a rule it is probable that attacks, whether external only or simultaneously external and internal, are not localized but distributed. The wall appears to undergo a general degradation, and it is only in the later stages that penetration by the fungus occurs.

GLASER (R. W.). **The green muscardine disease in silkworms and its control.**—*Ann. Entom. Soc. America*, xix, 2, pp. 180–192, 2 pl., 18 figs., 1926.

Green muscardine, a fungous disease caused by *Metarrhizium anisopliae*, appeared during the summer seasons of 1922 to 1925 among the writer's silkworms at the Rockefeller Institute for Medical Research, Princeton, New Jersey. The disease has been reported to occur on a number of insects of economic importance, e. g., the wheat cockchafer (*Anisoplia austriaca*), the sugar beet curculio (*Cleonus punctiventris*), and the froghopper and beetle

borer of sugar-cane (*Tomaspis postica* [*T. saccharina*] and *Rhabdocnemis obscura*) [*R.A.M.*, i, p. 271; iv, p. 348]. Evidence as to the value of the fungus in the control of these pests is conflicting.

Successful inoculation experiments are described. Silkworms do not contract the disease from swallowing the spores, but when the latter lodge on the skin infection rapidly occurs, followed by death in five or six days. Post-mortem examination of the insects revealed the presence, in nearly all the tissues, of segmented mycelial hyphae, which shortly afterwards ruptured the skin and covered the worms with a white down. A day or two later the sporophores developing from these hyphae produce a succession of olive-green, oblong spores, measuring 5 to 7 by 3 μ and enclosed in a resistant membrane. Spores kept dry for three years were found to be capable of germination, and they are also very resistant to heat, withstanding one hour's immersion in water at 60° C. They are killed, however, by 30 minutes' exposure to dry heat at 180°, by autoclaving for 20 minutes, or by boiling in water for 10 minutes. Three to six hours' exposure to 5 per cent. carbolic acid or 30 minutes in 1 in 2,000 corrosive sublimate also proved effective.

The disease may be controlled by the destruction of infected worms (the presence or absence of the fungus in a brood being determined by blood examinations), and by the regulation of humidity.

JIMÉNEZ (R.). **Las afecciones micosicas en Venezuela.** [Mycotic affections in Venezuela.]—*Gac. Med. de Caracas*, xxxiii, 5, pp. 69–76, 12 figs., 1926.

Observations are made on the various types of mycotic affections encountered in Venezuela, including actinomycosis, trichophytosis, mycetoma, sporotrichosis, and bronchomoniliasis. Certain dermatomycoses grouped under the names of 'carate', 'cute', 'carare', &c., are treated at greater length, and are said to be very widespread, their principal focus being the Zamora plains at the foot of the Cordilleras, while other regions are also involved to some extent. Different species of *Aspergillus*, *Penicillium*, and *Trichophyton* have been isolated from the squamae of patients suffering from this group of affections, in addition to a mould with short, broken hyphal filaments and spores of varying sizes referred to *Malassezia* [*R.A.M.*, v, p. 32] and producing dermatomycoses of several distinct colours ['pinta'] according to the skin of the individual.

MONTPELLIER (J.) & CATANEI (A.). **Blastomycose de l'avant-bras chez une femme indigène d'Alger.** [Blastomycosis of the forearm in a native Algerian woman.]—*Bull. Soc. Path. Exot.*, xix, 7, pp. 586–592, 2 figs., 1926.

In November, 1925, the writers examined a lesion [the clinical and histological symptoms of which are described] on the forearm of a native Algerian woman. The fungus isolated on Sabouraud's glucose agar from the pus exuded by the lesions showed three distinct forms, namely, (*a*) oval or globular yeast cells measuring 2·5 to 8 μ and reproducing by budding; (*b*) elongated bodies, 9 to 16 by 2 to 3 μ, occurring singly or in groups of two or three; and

(*c*) septate, simple or branched hyphae, 2 to 3 μ in width, which budded off, laterally and terminally, oval or elongated cells.

The cultural characters of the fungus, which is regarded as a new species of *Cryptococcus*, and named *C. catanei*, on a number of media are described. The best growth was made at 37° C. The organism resisted 30 minutes' heating at 60°. Gelatine was not liquefied nor milk coagulated; glucose, levulose, saccharose, and dextrin were fermented without production of gas. Inoculation experiments on rabbits [which are described] gave positive results.

FAIRLEY (N. H.), MACKIE (F. P.), CHITRE (G. D.), GOKHALE (S. K.), GORE (S. N.), MALANDKAR (M. A.), & SACASA (F. J.). **A progress report on researches in sprue (1924–1925).**—*Indian Journ. Med. Res.*, xiv, 1, pp. 105–123, 1 diag., 1926.

In connexion with an extensive investigation, carried out at Bombay, on the etiology and pathology of sprue [*R.A.M.*, v. p. 163], the writers made a detailed analysis of some 150 yeasts (*Monilia*) [*Candida*: *R.A.M.*, iii, p. 556] isolated from sprue and non-sprue cases. The strains were placed in two groups, the first comprising Ashford's and a few allied strains producing acid and gas in maltose and probably embracing the entire so-called 'pathogenic' group; while the second consists of maltose non-fermenters represented by *M. krusei* [*R.A.M.*, v, p. 610]. *M. ashfordi* [*M. psilosis*] was found in about half the cases of sprue, but it occurred also in persons suffering from other diseases and in healthy individuals to a similar extent, while the non-pathogenic or wild yeasts were equally well represented in the sprue cases.

None of the strains proved so toxic to guinea-pigs as those investigated by Ashford, massive doses by the intravenous, subcutaneous, or peritoneal route usually giving negative results. Inoculation experiments on monkeys were vitiated at the outset by the discovery, in the intestinal tract of healthy animals, of a *Monilia* indistinguishable from *M. psilosis*.

Extracts of *M. psilosis* were found to possess potent antigenic properties when tested against the sera of rabbits inoculated with the fungus, but the same antigen failed to fix excess of complement in the presence of sera derived from eight typical cases of sprue. On animal inoculation definite serological differences were demonstrated between the wild yeasts, such as *M. krusei*, and the 'pathogenic' species *M. psilosis* and *M. albicans*. On the other hand, a common group reaction in these complement fixation tests was noted for *M. psilosis* and *M. albicans*, so that this method is unlikely to prove of any value in the classification of yeasts, the revision and simplification of which is regarded as urgently necessary.

In summing up their views (based on thorough clinical examination) on the significance of *M. psilosis* in sprue, the writers explicitly reject the theory that any yeast plays a specific part in the etiology of this disease, or that sprue is to be regarded as a moniliasis of the digestive tract. At the most, *M. psilosis* may, during those phases of the disease in which its increased biological activity can be demonstrated, contribute in a secondary capacity to the production of certain intestinal features.

COOKSON (H. A.) & THORP (E.). **Notes on an outbreak of infantile diarrhoea associated with a parasitic fungus.**—*The Lancet*, ccxi, 5372, p. 330, 1926.

During the past two years the writers have encountered an unusually large number of cases of infantile diarrhoea, associated with an abnormally high rate of mortality, in the Sunderland area in the north of England. The condition was found to be due to infection by *Oidium* [*Candida*] *albicans*, and was frequently relieved by attention to the accompanying condition of thrush or ulcerative stomatitis caused by this fungus [*R.A.M.*, iv, p. 218].

KOTKIS (A. J.), WACHOWIAK (M.), & FLEISHER (M. S.). **The relation of Monilia to infections of the upper air passages.**—*Arch. of Intern. Med.*, xxxviii, 2, pp. 217–221, 1926.

In three cases of thrush the writers found *Monilia* or *Monilia*-like organisms, all of which are in general very similar in form and cultural qualities. Two were obtained from infants with evident buccal lesions (associated in one case with diarrhoea) [see preceding abstract], and the third from an adult patient. Similar organisms were also isolated from the sputum of five out of 14 individuals suffering from bronchial asthma, while in two cases of somewhat advanced tuberculosis (not included in the present series) *Monilia* was demonstrated in the sputum.

The relation of these organisms to bronchomoniliasis and bronchomycosis is discussed, the conclusion being reached that fungi of the *Monilia* group are only secondary or concomitant factors of such conditions [*R.A.M.*, iii, p. 289; v, p. 428], though possibly the chief agents in maintaining the chronic characters of the symptoms.

RAMSBOTTOM (J.). **Rose diseases caused by fungi.**—Enemies of the Rose, New Edn., Nat. Rose Soc., pp. 111–165, 7 pl. (5 col.), 5 figs., 1925.

A semi-popular account is given of the following rose diseases and their control: mildew (*Sphaerotheca pannosa*); black spot (*Diplocarpon rosae*) [*R.A.M.*, iv, p. 672]; rust (*Phragmidium subcorticium*); crown gall (*Bacterium tumefaciens*); downy or black mildew (*Peronospora sparsa*); leaf scorch (*Septoria rosae*, *S. rosae-arvensis*, and *S. rosarum*); stem canker (*Leptosphaeria coniothyrium*); rose graft disease (*Coniothyrium rosarum*); die-back (*Gnomonia rubi*); *G. rosae*; brown canker (*Diaporthe umbrina*); crown canker (*Cylindrocladium scoparium*); *Roesleria hypogaea*; sooty mould (*Fumago* sp.); and chlorosis.

Some general observations are made on the nature and classification of fungi and bacteria, and notes are given on the preparation and application of various fungicides.

First report of Apiosporella rhodophila (Sacc.) Petr. on the Rose in North America.—*Plant Disease Reporter*, x, 6, p. 86, 1926.

Microscopic examination of cankered branches of *Rosa setipoda* hybrid at Bell Station, Maryland, in June, 1926, revealed the presence of *Apiosporella rhodophila* (Sacc.) Petr. (= *Apiospora rhodophila* Sacc.). The spores from the affected specimen agree

in length with the recorded measurements of *Apiosporella rosae* (Oud.) v. Höhn.; in width with those of *A. rhodophila*; and in both dimensions with those of a European specimen of *A. rhodophila*. The last-named fungus is known to occur in Italy on *R. alpina* and in Czecho-Slovakia on *R. canina*, on which *A. rosae* has been reported from Holland and Germany.

H. (v.). **Seringenziekten.** [Lilac diseases.]—*Floralia*, xlvii, 29, p. 457, 1926.

Almost all the lilac bushes in a park at Leiden (Holland) are stated to be affected by a serious disease, the symptoms of which recall both those caused by *Phytophthora syringae* [*R.A.M.*, iv, p. 36] and those due to *Pseudomonas syringae* [ibid., v, p. 559]. *Syringa japonica* and *S. chinensis* appear to be more severely attacked than *S. vulgaris*. It is as yet uncertain which of these organisms is the primary cause of the disease, or whether both are involved. The affected bushes are growing on clay soil in a low-lying situation which would be likely to favour the development of both parasites.

Massey (L. M.). **Fusarium rot of Gladiolus corms.**—*Phytopath.*, xvi, 8, pp. 509–523, 2 figs., 1 graph, 1926.

Fusarium rot of *Gladiolus* corms, first observed in 1912, is of general occurrence in New York State, while affected material has also been received from a number of other States and Canada, up to 75 per cent. of the corms being infected in some cases. The only record of the disease in literature is believed to be a note by the writer (*Phytopath.*, xii, p. 53, 1922).

The first symptom of the rot is the development of small, water-soaked, reddish-brown spots on the sides and lower halves of the mature corms. The lesions are usually irregularly circular, ranging from one-quarter to one inch in diameter, the severity of infection during storage increasing with higher temperatures and greater humidity. The entire corm may be reduced to a brownish-black mummy. Prominent, irregularly concentric ridges in the lesions are a characteristic symptom of *Fusarium* rot on certain varieties. In two cases the causal organism has been isolated from the base of decaying stems and once from root lesions.

The morphological and cultural characters of the pathogen, which is regarded as a new variety of *F. oxysporum*, var. *gladioli*, are described. It differs from *F. oxysporum* in its slightly longer macroconidia (35 by 4·2 μ and 33·4 by 4·3 μ, for the dominant 0- and 3-septate forms, respectively); its higher percentage of 4-septate forms; the somewhat weaker development of the foot; and its absence of pathogenicity to tomato, pepper, eggplant, and potato. Infection was readily obtained with the new variety on uninjured corms in the laboratory and on those growing in the greenhouse and outdoors.

Seeliger. **Eine anscheinend in Ausbreitung begriffene Pelargonienkrankheit.** [A Pelargonium disease which appears to be spreading.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 8, pp. 63–64, 1926.

Pelargonium zonale plants in the Naumburg district [Saxony]

have recently been attacked by a leaf spot of obscure origin affecting chiefly the Rubin, Poiterine, Meteor, and Ulmia varieties. Small, circular, withered spots develop on the leaves and produce a brown discoloration, accompanied in young plants by an irregular protrusion of the healthy portion of the surface. There is reason to believe that the disease is infectious and that transmission is effected by the use of contaminated implements in propagation. Sanitary precautions, soil disinfection, and the use of the apparently resistant salmon-pink varieties are provisionally recommended.

MUNCK (H.). **Die Blattfleckenkrankheit des Efeu.** [The leaf spot disease of Ivy.]—*Gartenwelt*, xxx, 32, p. 504, 1926.

A brief popular description is given of the leaf spot disease of ivy [*Hedera helix*] caused by *Phyllosticta hedericola*. The large, round, dirty green (later pale grey) spots produced on the foliage are surrounded by a reddish to violet border on young leaves, while on old ones an immense number of black dots [pycnidia] develop on the upper side of the spots. In the initial stages the disease may be arrested by the removal of infected material, but where infection has begun to spread drastic pruning, thorough ventilation, and spraying with a copper sulphate fungicide are essential.

HOWITT (J. E.) & EVANS (W. G.). **Preliminary report of some observations on ascospore discharge and dispersal of conidia of Venturia inaequalis (Cooke) Winter.**—*Phytopath.*, xvi, 8, pp. 559–563, 1926.

Observations made during the past six years in a neglected orchard near the Agricultural College, Guelph, Ontario, have shown than the mean temperature of the winter months (especially January, February, and March) has a marked influence on the ascospore development and their primary discharge in the spring in the apple scab fungus (*Venturia inaequalis*) [*R.A.M.*, v, p. 614]. This factor has been found to be more important, under Ontario conditions, than the amount of precipitation from 1st April to the time of ascospore discharge, and also to be more closely related to the development and discharge of the ascospores than is the average temperature of the days in April and May preceding primary ascospore discharge. The ascospores were found to be capable of retaining their vitality until 8th August, and probably much later. Wind dissemination of the conidia up to a distance of at least 75 feet was demonstrated.

JØRSTAD (I.). **Beretning om plantesykdommer i land- og havebruket 1924–25. Beretning om sprøiteforsøk mot Epleskurv.** [Report on agricultural and horticultural plant diseases in 1924–25. Report on spraying experiments against Apple scab.]—Oslo, Grøndahl & Søns Boktrykkeri, 28 pp., 3 graphs, 1926.

In this report the writer describes in some detail the results of five years' experiments in the control of scab [*Venturia inaequalis*] on Torstein apples at Espe, Ullensvang [Hardanger Fjord, west coast of Norway]. The tests were mainly directed towards ascer-

taining the comparative efficacy of two or three summer applications of lime-sulphur (1 in 25) [*R.A.M.*, v, p. 561].

Three applications, immediately before and after blossoming and again in July, consistently improved the quality of the fruit, increased its average weight, and greatly augmented the yield (except in 1923 and 1924). An admixture of nicotine sulphate (Black Leaf 40) was given in the case of the first application. The third application could only be relied upon for decisive results when given during the latter half of July.

There was a well-defined correlation between the yield and quality of the fruit, especially on the sprayed trees, and the meteorological conditions during May (and, to a lesser extent, June) of the previous year. The exceptionally poor fruit seasons of 1923 and 1924 followed years with an abnormally low average temperature (under 10° C.) in May and June, accompanied by high precipitation (over 200 mm.).

Some figures are given concerning the economic aspect of spraying, the estimated cost of each summer application of lime-sulphur being 8 øre [about one penny] per tree for the lime-sulphur alone. The operations were very remunerative in 1921 and 1925 and fairly so in 1922, whereas in 1923 and 1924 the benefit was scarcely noticeable.

Notes are given on the results of two smaller experiments conducted at Lier [near the Swedish frontier] and Bygland [south of Norway] in 1923 and 1924, respectively. In the former locality the two applications immediately before and after blossoming proved very efficacious, raising the percentage of scab-free fruit (Gravenstein variety) by about 43. The third application was of no apparent value. There was no appreciable increase of yield or in the average weight of the fruit as a result of spraying.

In the latter test, carried out on the Annie Elizabeth, Granat, and Gravenstein varieties, the first application (16th to 18th June) was ineffectual, the decisive results in this case being given by the second and third sprays (15th July and 6th August, respectively).

DUTTON (W. C.). **Concentration of materials and rate of application in the control of Apple scab.**—*Michigan Agric. Exper. Stat. Tech. Bull.* 76, 18 pp., 1926.

An experiment was conducted during 1924 on twelve-year-old Hubbardston, Jonathan, and Wagener apples to determine the relation of the strength of the spraying material and the rate of application to the control of scab (*Venturia inaequalis*), foliage injury, and russeting of the fruit. This report deals mainly with the results concerning scab control.

The materials used were weak and strong Bordeaux mixture (2–4–100, plus 1 lb. lead arsenate powder and 6–12–100 plus 3 lb. lead arsenate powder, respectively): and weak, medium, and strong lime-sulphur, consisting of (*a*) 1·5 galls. in 100, plus 1·5 lb. lead arsenate powder; (*b*) 2·5 galls. in 100, plus 2 lb. lead arsenate powder; and (*c*) 3 galls. in 100, plus 3 lb. lead arsenate powder. Light, moderate, and heavy applications were given, the moderately sprayed trees receiving approximately twice, and the heavily sprayed ones about three times as many gallons as the lightly

sprayed. A pressure of 300 to 310 lb. was maintained. Five applications were given between 2nd May and 13th August.

The results of the tests plainly indicated that both Bordeaux mixture and lime-sulphur may be relied upon to give satisfactory control of scab, but the former is liable to cause so much russeting under Michigan conditions that its use is not recommended. A moderate application of moderate strength lime-sulphur was found to be the best for average conditions, reducing the incidence of infection from 100 to 2·2 per cent., but some foliage injury frequently results from this treatment.

Neither Bordeaux mixture nor lime-sulphur can be considered as an ideal spraying material, and any important advances in the treatment of scab must come through new materials or the improvement of those now in use.

There was a definite correlation between the amounts of active ingredients applied and the resulting control of scab, but the reduction of scab per unit increase of fungicidal material was greater between small numbers of units than with large numbers.

Labour and sprayer charges [particulars of which are given] are stated to be the chief determining factors in the cost of spraying, variations in the concentration of the materials being relatively unimportant. It is, therefore, poor economy to give heavy applications of weak materials when equal or better results are obtainable with lighter applications of stronger materials.

Two of the many factors involved in the control of scab were brought into prominence by these studies: firstly, that the susceptible portions of the plant must be well covered with a film of spraying material; and secondly, that the concentration of the actual fungicidal principle in this film must be above a certain point.

DOWSON (W. J.). **On a core rot and premature fall of Apples associated with Sclerotinia fructigena.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 155–161, 1 pl., 1 fig., 1926.

This is an account of an internal rot of certain varieties of apples, for the most part involving the premature fall of the fruit, which was noticed for the first time during the summer of 1925 at the Royal Horticultural Society's Gardens at Wisley, Surrey. The disease was most prevalent on the White Transparent variety, and to a lesser degree on Domino, Langley Pippin, and Duchess of Oldenberg. All these four varieties have a soft, mealy flesh, and their fruit matures in August and September.

Most of the diseased apples bore a small, soft, brown patch, about half an inch in diameter, either at the calyx or at the stem end, but in some cases they exhibited no external blemish at all. In every case, on being cut open the apples showed an extensive rot involving not only the upper part of the core, but also the tissue between this and the calyx. In apples with a brown basal patch the rot extended throughout the whole thickness of the fruit. The seeds, although fully formed, were nearly all soft and rotten, the parchment chamber was brown, and a fluffy, white mycelium was sometimes present in the core cavity. In more advanced stages, the rot extended into the flesh, the boundary separating the sound

from the diseased tissue being sharply marked not only by the contrast of colour, but also by a difference in consistency.

Isolations from the soft discoloured tissue produced a fungus morphologically indistinguishable in pure culture from *Sclerotinia fructigena*. The behaviour of the organism in inoculation experiments, as compared with that of an undoubted strain of *S. fructigena*, also leads the author to consider that the parasite belongs to this species. Evidence so far at hand is, however, inconclusive to show whether this fungus was the sole cause of the rot or whether other organisms were also involved. Neither is there definite evidence as to when and how the infection occurred, and experiments have been planned to elucidate these questions.

OSTERWALDER (A.). **Die Fleckenbildung beim Jonathan Apfel (Jonathan spot).** [Development of spots on the Jonathan Apple (Jonathan spot).]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxvi, 9–10, pp. 264–269, 5 figs., 1926.

In February, 1925, the writer examined a number of apples affected by Jonathan spot [*R.A.M.*, iv, p. 676; v, pp. 500, 501] at the Wädenswil Experimental Station, Switzerland. About fifty smooth, circular, shiny black spots, ranging from a pin's head to 2 mm. across, were scattered over the surface of the fruit and penetrated the tissues, about seven cell layers of which presented a dead, brown appearance. A lenticel was frequently conspicuous in the centre of the spots. Between and often within the dead cells, hyaline hyphae, composed of short segments of uneven diameter, and somewhat resembling those of species of *Exoascus* [*Taphrina*], were observed, the greatest number occurring just below the epidermal layer. These hyphae often contained numerous fat globules. A stroma, terminating in a layer of round, yeast-like cells, emerged through the aperture of the lenticel. No true spores were observed.

Cultures of this fungus on grape juice gelatine gave reddish, later brown to black, markedly rugose colonies. A pseudoparenchymatous stroma was formed, round the edges of which free, yeast-like cells developed. Fresh colonies were readily obtained from these cells, which appear to play the part of spores and are the probable agents of infection. On grape juice agar the colonies were greyish-green to yellow or chestnut-brown with white, flocculent edges, which later turned brownish-red. The hyaline hyphae, measuring 1·5 to 2 μ in diameter, penetrate deep into the agar. The rugose stroma on the surface of the agar presents a similar appearance in transverse sections to a sclerotium or unripe apothecium. It is composed of a dense subhymenial layer of hyphae, outside which is a layer of fine hyphae of a filamentous nature and then one of pseudoparenchyma, the surface of which is covered by a weft of loose threads. The general appearance suggests a species of *Tremella*.

Inoculation experiments with the fungus gave positive results on wounded Champagne Reinette apples, and the author concludes that Jonathan spot, contrary to the opinion of American investigators [loc. cit.] is due to a parasitic organism and not to physiological causes.

The optimum, minimum, and maximum temperatures for the development of the fungus were found to be 21°, below 5°, and below 33° C., respectively.

The spots produced on Jonathan apples are somewhat similar to those caused by fly speck (*Leptothyrium pomi*) [*R.A.M.*, ii, p. 536], except that the latter are very dark brown and less clearly defined than the former. They may also be removed by washing, which is not the case with Jonathan spot owing to its penetration into the tissues.

PETRI (L.). **La 'vitrescenza' delle Mele.** [Watercore of Apples.] —*Boll. R. Staz. Pat. Veg.*, vi, 3, pp. 253–260, 1926.

The abnormal condition of the core known elsewhere as watercore has been observed on certain varieties of apples in Italy. The author gives a somewhat detailed review of the investigations of this condition conducted in different countries, with special reference to the extensive experiments carried out in the United States by Brooks and Fisher [*R.A.M.*, v, p. 433]. He considers that the condition, which is the result of an accumulation of the sap in the intercellular spaces, is probably due to a modification in the semi-permeability of the plasmic membrane of the cell in consequence of some chemical change in the composition of the sap.

HIGGINS (B. B.). **Bacterial spot of Peach.**—*Georgia Agric. Exper. Stat. Circ.* 79, 8 pp., 4 figs., 1926.

Bacteriosis or bacterial spot of peach (*Bacterium pruni*) [*R.A.M.*, v, p. 504] is stated to have been present to an unusual extent in Georgia in 1926, apparently owing to a combination of the following factors: (*a*) loss of vigour by the trees during the drought of 1925, infection being most severe on high ground and very slight in low-lying areas; (*b*) absence of a fungicide from the dormant spray generally used; and (*c*) the occurrence of heavy rain and high wind on 10th May, the critical period for infection. The wind-driven rain washed the fungicide dust and spray residues of the summer applications from the leaves and fruits. Directions are given for the control of the disease [the symptoms and life-history of which are briefly described in popular terms] by cultural measures (including liberal fertilization with nitrates), and by the application of a dormant spray of 5–5–50 Bordeaux mixture plus 2 per cent. oil, followed by lime-sulphur during late April and early May.

WARD (J. M.). **Prune and Plum culture. Fungoid diseases.**—*Journ. Dept. of Agric. Victoria*, xxiv, 8, pp. 490–493, 1 fig., 1926.

Notes are given on the symptoms, life-history, and control of three serious fungous diseases of stone fruits in Victoria, namely, the highly destructive brown rot (*Sclerotinia cinerea*), which is stated to have developed on a widespread scale since 1918; prune rust (*Puccinia pruni*) [*P. pruni-spinosae*]; and shot hole (*Coryneum beijerinckii*).

TUBEUF (C. v.). **Auftreten der Blattbräune der Süsskirschen durch Befall von Gnomonia erythrostoma im Ramberger Tal (Rheinpfalz).** [The occurrence of leaf scorch of sweet Cherries as a result of infection by *Gnomonia erythrostoma* in the Ramberg Valley (Rhenish Palatinate).]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxvi, 7–8, pp. 237–238, 1926.

The writer summarizes an article in the *Rheinländer* of 8th March, 1926, by Walzinger, chief woods and forests officer of Landau, on the occurrence of leaf scorch (*Gnomonia erythrostoma*) of sweet cherries in the Ramberg Valley (Rhenish Palatinate) [see also *R.A.M.*, v, p. 615]. The variety chiefly affected is the widely grown and popular Weichsel, which is extensively used for preserving; while the Maiweichsel, Früh, Freinsheimer Schloss, a green-stalked variety of sour cherry, which is very suitable for making kirschwasser, and the wild black cherry are highly resistant. Varietal susceptibility is stated to be extremely pronounced in mixed orchards.

Sheltered and humid situations appear to be preferred by the fungus, while mountain slopes and other exposed sites are relatively free from the disease.

Energetic control measures are stated to have been instituted by the municipal authorities.

BERKELEY (G. H.) & JACKSON (A. B.). **Studies in Raspberry diseases. Mosaic, leaf curl, rosette, and wilt.**—*Canada Dept. of Agric., Pamphlet* 72, N.S., 15 pp., 6 figs., 1926.

Notes are given on the origin, symptoms, mode of dissemination, and control under Canadian conditions of mosaic, leaf curl, rosette, and wilt (*Verticillium ovatum*) of the raspberry [*R.A.M.*, v, pp. 563, 564]. Rosette or bramble streak [formerly called eastern blue stem: *R.A.M.*, ii, p. 128] only affects black raspberries. It has been observed on two plantations in Ontario, but without the pronounced stem markings reported in this disease in the United States.

Mosaic, leaf roll, and rosette can be controlled by planting only healthy certified stock (a supply of which is now available in Ontario), followed by systematic roguing. Leaf roll is considered of minor importance in this area, so effective has been the result of control measures. It is stated to be probably disseminated by another species of aphid, *Amphorophora rubi*, than that responsible for spreading mosaic, namely, *Aphis rubiphila*.

DODGE (B. O.) & WILCOX (R. B.). **Diseases of Raspberries and Blackberries.**—*U.S. Dept. of Agric. Farmers' Bull.* 1488, 32 pp., 20 figs., 1926.

Popular descriptions are given of the symptoms and treatment of the following diseases of raspberries, blackberries, and dewberries [*Rubus* spp.] in the United States, with notes in some cases on varietal susceptibility and other points of interest.

A. Raspberries. Mosaic; leaf curl; streak (or eastern blue stem); anthracnose (*Plectodiscella veneta*); crown gall (*Bacterium*

tumefaciens); cane blight (*Leptosphaeria coniothyrium*); orange rust (*Gymnoconia interstitialis*); late rust (*Puccinastrum americanum*), the alternate host of which is believed to be hemlock [*Tsuga* sp.] or some species of fir, and which occasionally appears in an epidemic form, causing premature defoliation in August; yellow leaf rust (*Phragmidium imitans*); mildew (*Sphaerotheca humuli*); spur blight (*Mycosphaerella rubina*); leaf spot (*M. rubi*); blue stem (*Verticillium albo-atrum*); and fruit rots caused by various moulds and other fungi.

B. Blackberries and dewberries. In addition to some of the diseases listed above, the following are mentioned. Double blossom (*Fusarium rubi*), a common and severe disease in the southern States, is characterized by the development, in the spring following infection, of small witches' brooms at the nodes. The flower buds are larger and coarser than usual, the petals much wrinkled and twisted, frequently pinkish and with large, long pistils. No berries are produced at these points, but uninfected parts of the same cane may bear some poor fruit. The Florida Marvel variety is frequently affected by double blossom, though the typical witches' brooms are not always apparent. The only known method of control is the collection and destruction of the double blossom clusters before the flowers open.

Cane rust (*Kuehneola uredinis*) [*K. albida*], which is stated to be often mistaken for orange rust, causes a desiccation of the canes and prevents the ripening of the fruit. The leaf infections may be so severe as seriously to affect the next year's crop. The golden or lemon-yellow pustules are produced throughout the summer on canes and leaves, but the fungus causes only local damage, which may be greatly minimized by the destruction of infected material. Brief directions are given for the differentiation of cane from orange rust, the latter invading the roots, canes, and leaves, causing stunting and sprouting from the root and crown. *G. interstitialis* also spreads to new plants through growth from the roots and crown into new shoots, as well as by spores in the spring, while the dissemination of *K. albida* is restricted to the latter method.

Leaf blight (*Cercospora rubi*) may be so prevalent during warm, rainy weather on Lucretia dewberries in the southern States that large areas assume a brown, scorched appearance.

Black rot (*Phyllosticta carpogena*) is liable to develop in transit on overripe dewberries, while the so-called 'piebald' berries, which are characterized by absence of colour and unpleasant flavour of the carpels, are frequently attacked by various moulds. e. g., *Rhizopus*, *Alternaria*, and *Patellina*.

NOORDANUS (G.). **Mozaiekziekte der Frambozen.** [Mosaic disease of Raspberries.]—*Floralia*, xlvii, 30, pp. 472–473, 1 fig., 1926.

A brief note is given on the occurrence of mosaic on raspberries in Holland. The writer has observed the most severe symptoms on the Hornet and Superlative varieties, the Devon being resistant and the newly introduced Lloyd George entirely immune. The young shoots of autumn raspberries are little affected, while wild bushes remain quite healthy.

HANSFORD (C. G.). **Panama disease in Jamaica.**—*Jamaica Dept. of Sci. & Agric., Microbiol. Circ.* 5, 35 pp., 1926.

The present paper is a summarized account of the Panama disease of bananas, observed in Jamaica for the first time in 1911, and of its causal organism, *Fusarium cubense* [*R.A.M.*, v, p. 654].

As indicating the losses caused in Central America, the statement is made that 91,000 acres of the estates of the United Fruit Company, formerly under the crop, can no longer be profitably cultivated on account of the disease. It is further stated that the disease is known to occur in Central America, the West Indies, Hawaii, India, Siam, the Philippines, Canary Islands (on *Musa cavendishii*), Sierra Leone, and probably elsewhere.

In discussing the bearing of climatic conditions on the disease, it is pointed out that until 1926 it was thought in Jamaica that bananas grown under irrigation would not be attacked [*R.A.M.*, iii, p. 407; iv, p. 528], but lately several cases have occurred in an irrigated district.

Realizing that the destruction of bananas involved by the quarantine regulations was becoming one of the chief limiting factors in banana production in Jamaica, the already reduced area of quarantine in severely affected regions has been further cut down in 1926 to, roughly, one-quarter of a square chain.

According to the author's estimate the number of diseased banana plants in Jamaica in 1926 may be expected to reach a total of nearly 23,000, as against 14,199 in 1925.

VAN OVEREEM(C.) & SCHWARZ (M. B[EATRICE]). **Oidiaceae. Oidium caricae Noack.**—*Icones Fungorum Malayensium*, xvi, 4 pp., 2 pl. (1 col.), 2 graphs, 1926. [German.]

Seedlings of *Carica papaya* at Buitenzorg, Java, showed symptoms of wilting, beginning with the lower leaves, which became limp and yellow and dropped one by one. The stems and petioles were covered by a white mycelium, which spread to the large veins on the under side of the leaf. Some weeks later the young leaves showed irregular, yellow mottling of the mosaic type round the veins, a condition which was also found to be associated with the presence of the above-mentioned mycelium. Similar symptoms were observed on fully grown trees in the open, the fungus being found also on the pedicels of male flowers.

The average measurements of 200 conidia of the causal organism, *Oidium caricae*, were 26·61 by 18·66 μ in the greenhouse and 28·04 by 18·85 μ in the open air. A German diagnosis of the fungus is given, together with an historical survey and a brief taxonomic discussion of the genus. A bibliography of 21 titles is appended.

WHETZEL (H. H.). **Nature of liquid and dust spray materials.**—*Amer. Fruit Grower*, xlvi, 4, p. 46, 1926.

This is a partial reprint of an address given before the Indiana State Horticultural Society, in which the mode of operation of Bordeaux mixture and other fungicides is described in popular terms, and the present and future possibilities of dusting are discussed.

MENDIOLA (N. B.) & OCFEMIA (G. O.). **The work of breeding disease resistant crop plants at the College of Agriculture at Los Baños.**—*Philipp. Agric.*, xv, 3, pp. 117–128, 7 figs., 1926.

An account is given of the work in progress at the College of Agriculture of the University of the Philippines in connexion with the breeding of disease-resistant crop plants.

Of the many thousands of sugar-cane seedlings produced since 1919, one, C.A.C. 87, has remained immune from Fiji disease [*Northiella sacchari*] and mosaic even when grown in close proximity to heavily infected canes.

Tests for the resistance of abaca (*Musa textilis*) to bunchy top [*R.A.M.*, iv, p. 468] have been facilitated by the discovery in June, 1925, of the aphid vector, *Pentalonia nigronervosa* [ibid., v, p. 310], on diseased banana and abaca plants in the Philippines.

Reinking's work on varietal susceptibility of different species of citrus to canker (*Phytomonas* [*Pseudomonas*] *citri*) is summarized (*Philipp. Agric.*, ix, p. 121, 1921). In a study of the citrus blight due to *Phytophthora faberi*, extending from 1923 to 1925, it was observed that *Citrus nobilis* was severely infected; *C. limonia* and *C. maxima* moderately so; *C. aurantium*, *C. medica*, and *C. aurantifolia* were very resistant (especially the last-named); while *C. mitis* appears to be practically immune.

None of the six varieties each of eggplant [*Solanum melongena*] and tomato, or of the twelve varieties of chilli pepper [*Capsicum annuum*] tested for resistance to bacterial wilt [*Bacterium solanacearum*] has proved absolutely immune from this destructive disease, but Bolivian pepper is comparatively resistant and the native varieties of tomato and eggplant withstand infection better than foreign ones.

Hybridization experiments are in progress with a view to producing a strain of pineapple resistant to wilt and fruit rot [*Thielaviopsis paradoxa*]. One or two of the eleven hybrids between the susceptible foreign Smooth Cayenne and the resistant native Red Spanish are very promising as regards the quality of the fruit.

It has been found that imported varieties of maize are more susceptible to leaf blight (*Helminthosporium inconspicuum*) [*H. turcicum*: *R.A.M.*, iv, p. 29] than the native or foreign but acclimatized ones.

In 1922 it was ascertained that only 21 out of 126 varieties of rice cultivated in the Philippines were quite free from infection by *Sclerotium rolfsii*. A list of these is given and 18 particularly susceptible varieties are also enumerated.

Mexican avocados [*Persea gratissima*] have been found most susceptible to anthracnose (*Glomerella cingulata*) [*R.A.M.*, v, p. 109] and the West Indian Bottle Neck and Cyrus varieties least so.

JOHNSON (J.). **The attenuation of plant viruses and the inactivating influence of oxygen.**—*Science*, N.S., lxiv, 1652, p. 210, 1926.

The possibility of the attenuation of plant viruses [*R.A.M.*, v, pp. 119, 339] is stated to have received comparatively little atten-

tion. The writer recently succeeded in attenuating the virus of tobacco mosaic and other forms of mosaic affecting tobacco by the use of heat. Soon after inoculation, plants are placed in constant temperature chambers for ten days or more at 35° to 37° (C.), at which temperature the symptoms are wholly or partially masked [ibid., i, p. 244]. Transfers from such plants, in comparison with untreated controls, show a very decided attenuation of the virus, which usually produces only mild mottling and little or no malformation. This attenuated virus can be repeatedly transferred serially through tobacco plants without apparent alteration of the attenuated condition.

The tobacco mosaic virus may retain its vitality for several months in soil, its duration of life, however, being much shorter in sandy than in clay soils. Preliminary experiments indicate that this variation is largely determined by oxygen relations. Apparently the virus of tobacco mosaic is quite sensitive to the inactivating influence of oxygen when properly exposed to it under moist conditions.

MILLER (J. W.). **Eight generations of selection within a clone of Helminthosporium sativum.**—*Amer. Naturalist*, lx, 669, pp. 340–343, 1 graph, 1926.

Experiments to determine whether the mean number of septa in *Helminthosporium sativum* spores could be changed by pure line selection were carried out through eight generations.

The clone was begun with a seven-celled spore taken from the original isolation from diseased wheat roots in Wisconsin. From the progeny of this parent spore, the development of the plus strain was attempted by starting with a ten-celled spore and repeatedly choosing for subsequent generations spores with high cell numbers. A minus strain was also attempted, beginning with a five-celled spore, and carrying it on through few-celled spores.

The tabulated results indicate that, while the sizes of the parental spores for each of the eight generations differed widely, the average of the progenies (plus and minus) were nearly the same, so that the attempt to separate the single clone into two by selection proved ineffective. According to the graph comparing the means of the eight generations, the slight deviations are not permanent, and at the end of the eighth generation the averages of the two attempted strains are almost at the same point. Selection failed to produce two strains.

AYERS (T. T.). **Selection within a clone of Helminthosporium sativum during seven generations.**—*Amer. Naturalist*, lx, 669, pp. 344–346, 1 graph, 1926.

Similar work to that described in the previous abstract was carried out with a single seven-celled spore of *Helminthosporium sativum* through seven generations, the selection being made of a nine-celled and a five-celled spore in each generation.

The tabulated results and chart show in this case a considerable variation in the means of both sub-strains, but this was sometimes in the direction of selection and sometimes not. The results indicate that selection within a clone of *H. sativum* is non-effective.

This agrees with La Rue's results with clones of *Pestalozzia* [*R.A.M.*, i, p. 452].

MURPHY (P. A.) & M'KAY (R.). **Investigations of the leaf-roll and mosaic diseases of the Potato.**—*Journ. Dept. Lands and Agric. Ireland*, xxvi, 1, pp. 1–8, 2 pl., 1926.

The present interim report is a summary of the authors' previous papers [*R.A.M.*, iii, pp. 160, 601; v, pp. 121, 442] dealing with the investigations of the leaf roll and mosaic diseases of the potato which are being carried out at Glasnevin, near Dublin. A brief description is also given of the methods used in producing seed potatoes free from virus diseases, and the paper terminates by a summary of a study extending over three years of the value of potatoes from different parts of Ireland for seed purposes. It is stated that with the exception of localized areas around the principal cities, the whole country is practically free from the more serious types of degeneration, and careful observation has failed to show that virus diseases are more common in the south and west of Ireland than elsewhere.

ESMARCH (F.). **Das Blattrollen der Kartoffel.** [Leaf roll of the Potato.]—*Die Kranke Pflanze*, iii, 8, pp. 143–148, 1926.

This is a popular account of the symptoms, etiology, and control of various potato diseases associated with leaf rolling, namely, the well-known leaf roll degeneration disease, another degeneration disease known as bouquet disease ('Bukettkrankheit'); the leaf roll accompanied by a wilting and yellowish or reddish discoloration of the foliage (beginning with the upper leaves) due to blackleg [*Bacillus atrosepticus*]; a rolling of otherwise healthy-looking leaves accompanying infection by *Hypochnus* [*Corticium*] *solani*; similar symptoms connected with basal infection by various fungi and bacteria collectively known as foot rots; a wilting and curling of the yellowish-green foliage characteristic of bacterial ring disease [*Bacterium solanacearum*]; and similar phenomena due to unfavourable environmental conditions or to insect injury.

SANFORD (G. B.). **Some factors affecting the pathogenicity of Actinomyces scabies.**—*Phytopath.*, xvi, 8, pp. 525–547, 2 figs., 1 graph, 1926.

A study was carried out at the Minnesota Agricultural Experiment Station to determine the effect of temperature, moisture, oxygen supply, soil reaction, and stimulatory substances on the germination, growth, and pathogenicity of the causal organism of potato scab (*Actinomyces scabies*) [*R.A.M.*, iii, p. 60]; while an attempt was also made to ascertain the nature of the control alleged to result from ploughing under a green crop of rye.

A synthetic dextrose-nitrate medium was used in most of the experiments. The fungus was found to grow well within a wide range of temperature (8° to 38° C.), good development occurring between 13° and 32° with an optimum at 27°. Under average field conditions, therefore, temperature is not likely to prove an important factor. The spores survive temperatures up to 90° (moist heat) for ten minutes.

A. scabies is strongly aerobic. Although an extremely small supply of oxygen is required to start germination, a large quantity is necessary for subsequent development. The dark aerial hyphae associated with maturity do not develop in the absence of oxygen. The limiting factor for germination and growth is the amount of oxygen, not its partial pressure.

The germination of *A. scabies* spores on nutrient agar was found to be greatly retarded when a film of water persisted around them. The relative effect of moist and dry soils was tested. No increase in the number of colonies occurred in the driest soil (6·25 per cent.), but at 10, 15, 21·2, and 27 per cent. humidity there was a progressive increase to about five times the original amount, followed by a sudden drop at 33·7.

The limiting acid reaction for spore germination in the strain of *A. scabies* used was found to be about P_H 5·3. The most rapid germination and optimum development took place at P_H 8·5. Severe infection may be expected to occur in soils ranging from a strongly alkaline reaction to at least P_H 5·4, owing to the higher P_H value of the tuber and to the strong tendency of the pathogen to produce an alkaline reaction (P_H 7·2) in the scab pustules.

Green rye plants, mixed with thoroughly infested soil at a reaction of P_H 5 to 5·4, at the rate of 50 tons per acre, showed no tendency to reduce infection, neither was any perceptible increase in the soil acidity effected during a period of 58 days. In the laboratory there was only a very slight increase after 75 days in the acidity of soils receiving very large amounts of rye. The apparent success achieved by the use of green rye on some soils is thought to be due to the inhibiting influence of certain predominant micro-organisms on the development of *A. scabies*.

Certain strains of bacteria, e.g., *Bacterium fluorescens*, cultured in the same solution with *A. scabies*, inhibited the growth of the latter by the production of excessive acidity. *Bact. fluorescens* and certain other soil organisms produced more acid when grown in conjunction with *A. scabies* than alone. A bacterial strain isolated from the soil and cultured in Czapek's solution prevented the development of the scab organism by some means other than excessive acidity. Nearly all the 33 bacterial strains used in this study rendered the conditions for the growth of *A. scabies* more or less unfavourable on a potato-dextrose agar.

GLYNNE (MARY D.). **Wart disease of Potatoes: the development of Synchytrium endobioticum (Schilb.) Perc., in 'immune' varieties.**—*Ann. of Appl. Biol.*, xiii, 3, pp. 358–359, 1 pl., 1926.

A method was described by the author in an earlier paper [*R.A.M.*, iv, p. 501] for testing new potato varieties for their immunity from, or susceptibility to, wart disease (*Synchytrium endobioticum*). Small growths have since been observed on the shoots of certain varieties that were officially certified as immune, but these incipient infections never developed into actual warts. Examination showed that infection by *S. endobioticum* had evidently taken place in such cases, but development was limited to the stage when the sorus contained a number of summer sporangia. In some cases the empty sorus which had apparently liberated the summer

sporangia was found. Reinfection by zoospores of these summer sporangia and the subsequent formation of winter sporangia have not yet been detected. Other 'immune' varieties showed no signs of infection when tested by this method. It is not thought that the apparent infection of immune varieties can be explained by the presence of susceptible rogues.

VOWINCKEL (O.). **Die Anfälligkeit deutscher Kartoffelsorten gegenüber Phytophthora infestans (Mont.) De By, unter besonderer Berücksichtigung der Untersuchungsmethoden.** [The susceptibility of German Potato varieties to *Phytophthora infestans* (Mont.) De By, with special reference to the methods of investigation.]—*Arb. Biol. Reichsanst. für Land- u. Forstwirtsch.*, xiv, 4, pp. 588-641, 1926.

Preliminary to the investigations on the varying degree of susceptibility of different potato varieties to late blight (*Phytophthora infestans*), the influence of the following external factors on the development of the fungus was examined: temperature, atmospheric humidity, intensity of illumination, and age and nutritional condition of the host [*R.A.M.*, v, p. 381]. The criteria selected for the evaluation of the experimental data were intensity of fructification (i. e., vigour of sporangial development within a given period) and eventual formation of aerial mycelium on the leaves, and rapidity of hyphal growth in the tuber tissues. The only nutrient substrata used in the tests were portions of the natural host of *P. infestans*, and the inoculation experiments were carried out exclusively with freshly discharged zoospores.

The optimum temperature for fructification and for mycelial development was found to be between 19° and 22° C., the maximum and minimum being 26° and 8·7° and 27° and 4·6°, respectively. For zoospore formation the optimum is between 12° and 14°.

Complete saturation of the air with water vapour being admittedly the most suitable condition for sporangial formation, the experiments relating to this factor were confined to ascertaining the minimum degree of saturation essential for sporangial fructification. It was found that a degree of atmospheric saturation of 73 per cent. on the leaves and 64 per cent. on the tubers rendered sporangial development possible. Below these points only vegetative growth occurred. The fact that sporangia developed on the tubers at a lower degree of saturation than on the leaves is regarded as indicating that the nature of the substratum modifies the influence of atmospheric humidity on sporangial development.

The observation of plants grown in sand in pots treated with various nutrient mixtures showed that the absence of nitrogen, phosphorus, or magnesium from the nutrient exercised no influence on the development of the parasite. The fructification of the fungus was considerably less profuse on plants deprived of potassium than on those from which one of the above-mentioned substances was withheld.

The growth of *P. infestans* did not appear to be affected by the degree of intensity of illumination.

The age of the host influences the development of the parasite in so far as the latter finds more favourable opportunities for

growth at a rather advanced stage of maturity of the leaves [*R.A.M.*, v, p. 180].

Two methods were used for the statistical evaluation of the varying degree of susceptibility of the aerial organs of the host plants examined. In the first, the time elapsing between infection and the beginning of sporangial formation (incubation period) was used as a gauge; while in the second the degree of susceptibility was judged by the size of the leaf area destroyed by the parasite four days after infection.

Generally speaking, the incubation period of *P. infestans* is shortest and its diffusion through the leaf most rapid in the case of the early and medium-early ripening varieties, e.g., Primel, Kuckuck, Luzie, Feodara, and Jubel. The medium-late and late varieties, such as Parnassia, Prof. Gerlach, Silesia, Pirola, Gloriosa, Wohltmann, Bismarck, Repo, and Hindenburg are moderately to slightly susceptible. Absolute immunity was not found in any cultivated variety.

An attempt was made to obtain corresponding data on varietal susceptibility in tubers by measuring the rapidity with which the hyphae penetrated the cortical parenchyma. However, in view of the irregularity of the progress of the parasite in different tissues, it appears questionable whether the leaf and tuber data are really comparable. No positive correlation was found between the susceptibility of foliage and tubers to *P. infestans*. The tubers of Dahlem selections with highly resistant foliage were equally susceptible with those of selections showing severe leaf infection.

In connexion with the experiments on cultivated varieties and selections, an examination was made of certain Solanaceae, the reaction of which to *P. infestans* was hitherto unknown. *Solanum dulcamara, S. nigrum, Physalis alkekengi, Hyoscyamus niger, Lycium turcomanicum,* and *L. halimifolium* proved susceptible, but with the exception of the last-named, the incubation period was very long (five to six days). On *L. halimifolium* the fungus fructified abundantly in three days, and this plant was also found three times to be naturally infected by *P. infestans* in the open. The identity of the organism on *L. halimifolium* with *P. infestans* on the potato was established by cross-inoculation experiments and sporangial measurements. *Nicotiana tabacum, S. sisymbriifolium, S. miniatum,* and *Petunia* sp. failed to contract infection after heavy inoculation, and may therefore be regarded as immune.

NEUWEILER (E.). **Kartoffelspritzversuche 1916–1925.** [Potato spraying experiments 1916–1925.]—*Landw. Jahrb. der Schweiz,* xl, 4, pp. 469–515, 4 graphs, 1926.

During the last ten years a considerable number of potato spraying experiments have been systematically conducted in various parts of Switzerland to determine the influence on the control of blight (*Phytophthora infestans*) of the following spraying factors: varying concentration of the Bordeaux mixture; time of application; action of different copper-saving ingredients; and effects of various commercial preparations. Investigations were further made on the adhesiveness and suspensory capacity of the mixtures and on the incidence of infection at harvest.

The favourable effect, on susceptible varieties, of spraying during damp, mild seasons was unmistakable. In 80 out of 97 tests, increased yields were recorded. The foliage of the treated plants remained green longer than that of the controls, while the tubers were more numerous and in a sounder condition, which enabled them to resist storage infections. Spraying further increased the amount of dry substance in the tubers.

Basic Bordeaux mixture is stated to be in most general use for the control of blight. The best results were obtained with the 2 per cent. mixture [*R.A.M.*, iv, p. 590], which in 21 experiments augmented the yield on an average by 26·9 quintals [1 q. = nearly 2 cwt.] per hect. The corresponding figures for the 1 and 1·25 per cent. solutions were 18·8 q. for early and 23·9 q. for late applications. The 2 per cent. mixture also gave better results in respect of dry substance content and soundness of the tubers. However, when a scarcity of copper sulphate prevails the strength of the mixture may be reduced from 2 to 1 per cent. without serious loss.

As a rule *P. infestans* does not develop in Switzerland before the beginning of July, but in 1924 it appeared unusually early (towards the end of June) and caused heavy damage where spraying was neglected. The fungicidal action of the copper is most pronounced when the mixture is applied shortly before the development of the fungus on the plant. On the average, late applications (end of June to early July and again four weeks later) gave the best results. With the 1 per cent. solution the late applications produced an increased yield of 5·1 q. per hect. over the early, while at a strength of 2 per cent. the yields were equal irrespective of the date of spraying. The susceptible early potatoes should be sprayed in the middle of June and middle of July. No substantial benefit was derived from more than two applications.

The admixture of 1 per cent. iron sulphate with 1 per cent. Bordeaux mixture was of little value, but the addition of 1 per cent. potash alum rendered the efficacy of the 1 per cent. solution almost equal to that of the 2 per cent. The addition of ammonia failed to influence the action of the 2 per cent. Bordeaux mixture.

Among the commercial preparations tested, the liquids were found to be superior to the dusts. Economy in the consumption of copper is secured by the use of these mixtures, many of which contain copper in its highly adhesive colloidal form.

An increase of yield was given by the late applications of Bordola pasta (basic copper sulphate in gelatinous form, supplied by A. Dupré, G. m.b.H., Köln-Kalk); vitriolin, a highly adhesive dust containing 12·7 per cent. copper sulphate and a small quantity of ammonium sulphate (Agricola S.A. Bussigny); kurtakol, nosperal, ciprin [*R.A.M.*, v, pp. 77, 78], cuprosan [ibid., v, p. 497], nosperit, nosperit dust, and kukaka (a mixture of copper sulphate, hydrated lime, and casein supplied by R. Maag, Dielsdorf). None of these preparations [notes on the chemical composition of which are given], however, was equal on an average to 2 per cent. Bordeaux mixture.

A small admixture of tannin (0·01 to 0·2 per cent.) considerably increased the suspensory capacity and adhesiveness of the Bordeaux

mixture. In the preparation of the latter the copper sulphate should be slowly stirred into the milk of lime, and not vice versa, in order to maintain the suspensory capacity.

Observations and experiments carried out from 1922 to 1925 indicate that the occurrence of tuber infection is largely dependent on the constitution of the soil and on the degree of withering of the green parts at harvest. The incidence of infection was found to be much higher in heavy than in light soils, and the less the plants were withered the more severe was the subsequent tuber rotting. The disease was least in evidence when the tubers were lifted one to two weeks after the withering of the tops. The incidence of infection was increased by leaving the potatoes in the field till the next day, especially under a covering of withered potato foliage [*R.A.M.*, i, p. 251 ; iv, p. 629].

P. infestans was found to penetrate the tubers through wounds in the skin. Many potatoes showed hilum infections. Out of 1,955 tubers examined, 678 or 34·7 per cent. were infected. Many of these showed secondary infections, chiefly by bacteria and species of *Fusarium*.

TILFORD (P. E.). **Potato dusting and spraying in 1925.**—*Bimonthly Bull. Ohio Agric. Exper. Stat.*, xi, 4, pp. 141–144, 1926.

In the experiments conducted in Ohio during 1925 to test the relative value of copper-lime dusts and liquid Bordeaux mixture in the control of early blight [*Alternaria solani*], late blight [*Phytophthora infestans*], and hopperburn of the potato, the dusted plots, contrary to the results obtained in 1924 [*R.A.M.*, iv, p. 500], yielded somewhat higher crops than the sprayed plots. An explanation of this result may be that in 1925 there were not many heavy rains to wash the dust from the leaves. It was also observed that home-mixed dusts gave better results than the ready mixed preparations, and they may be taken to be at least as satisfactory as commercial dusts.

BRAUN (H.). **Die Bekämpfung von Hypochnus solani P. u. D. (Rhizoctonia solani K.) durch Beizung. Ein Beitrag zur Frage der Kartoffelbeizung.** [The control of *Hypochnus solani* P. & D. (*Rhizoctonia solani* K.) by steeping. A contribution to the question of Potato disinfection.]—*Arb. Biol. Reichsanst. für Land- u. Forstwirtsch.*, xiv, 4, pp. 411–454, 2 graphs, 1926.

This is a more comprehensive account, accompanied by tables, of the author's investigations on the control of *Hypochnus* [*Corticium*] *solani* by disinfection of the seed-potato tubers than that already noticed from another source [*R.A.M.*, v, p. 514]. A bibliography of 81 titles is appended.

RICHARDS (B. L.). **Seed-Potato treatment for the control of four common diseases, Rhizoctonia, scab, blackleg, dry-rot.**—*Utah Agric. Exper. Stat. Circ.* 60, 14 pp., 7 figs., 1926.

During the period 1920 to 1924 the average annual loss from disease sustained by the Utah potato crop was 19·5 per cent. Brief

popular descriptions are given of four surface tuber-borne diseases, namely, stem canker (*Rhizoctonia*) [*solani*], common scab [*Actinomyces scabies*], blackleg [*Bacillus atrosepticus*], and dry rot [*Fusarium* spp.], and instructions given for their control by treatment with corrosive sublimate or hot formaldehyde [*R.A.M.*, v, p. 627].

McCubbin (W. A.), Hartman (R. E.), & Lauer (K. M.). **Seed Potato certification in Pennsylvania.**—*Pennsylvania Dept. of Agric. Bull.* 420, 45 pp., 15 figs., 1926.

An account is given of the development of the potato seed certification service established in Pennsylvania in 1920. During 1924, an average increase in yield of 32·9 bushels per acre was reported by 23 growers at 16 different counties from the use of certified seed as compared with home-grown seed.

Three field inspections are made. The amounts of disease permissible in the first inspection, which is made before roguing and when the plants are 8 to 10 inches high, are: leaf roll 5 per cent., mosaic 3 per cent., spindle tuber 3 per cent., curly dwarf 1 per cent., blackleg [*Bacillus atrosepticus*] 2 per cent., wilt [*Fusarium* spp. or *Verticillium albo-atrum*] 2 per cent., all diseases combined 6 per cent. In the second inspection (at flowering time) the maximum permitted is leaf roll 2 per cent., mosaic 2 per cent., spindle tuber 1 per cent., curly dwarf 1 per cent., all the above virus diseases together 3 per cent., wilt 2 per cent., blackleg 1 per cent., all diseases combined 4 per cent. The third inspection (following final roguing) allow virus diseases, as above, combined 1 per cent., giant hill 2 per cent., wilt 1 per cent., blackleg 1 per cent., all diseases 2 per cent.

The following are the standards for tuber infection: common scab [*Actinomyces scabies*] 5 per cent., *Rhizoctonia* [*Corticium solani*] 10 per cent. of moderate infection, powdery scab [*Spongospora subterranea*] no tolerance, stem discoloration 5 per cent., spindle tuber 1 per cent.

A description is given of the various potato diseases of general occurrence and a key which claims to allow of their identification with a fair degree of accuracy. Methods for the disinfection of seed potatoes are briefly described and the use of mercuric chloride in preference to cold formaldehyde is recommended. There are also notes on general sanitation and roguing.

Hudig (J.), Meyer (C.), & Goodyk (J.). **Ueber die sogenannte 'Urbarmachungskrankheit' als dritte Bodenkrankheit.** [On the so-called 'reclamation' disease as a third soil disease.]—*Zeitschr. für Pflanzenernährung u. Düngung*, Teil A, viii, 1, pp. 14–52, 21 figs., 1926.

The authors' investigations on the etiology and control of the 'reclamation' disease [*R.A.M.*, v, pp. 121, 543] in Holland are fully described. The most susceptible crops are summer cereals (especially white oats), Papilionaceae, and beets. The trouble is regarded as entirely distinct from the grey speck ['Veenkoloniale' disease], and soil acidity diseases [ibid., iii, p. 425; iv, pp. 275, 342]. In 1925 it was observed that the copper sulphate applied for the control of

the reclamation disease on excessively alkaline soil counteracted the beneficial effect on grey speck of subsequent applications of manganese sulphate.

WAKSMAN (S. A.) & CAREY (CORNELIA). **The use of the silica gel plate for demonstrating the occurrence and abundance of cellulose-decomposing bacteria.**—*Journ. of Bact.*, xii, 2, pp. 87–95, 1926.

A method is described which has been found very convenient for demonstrating the presence and nature of cellulose-decomposing bacteria [a brief review of the literature on which is given]. Using this method a good growth of cellulose-decomposing bacteria can be obtained in 48 to 72 hours by inoculating soil particles directly on the specially treated plates. The authors' tests indicate that, under certain conditions, there is a soil population of spore-forming bacteria capable of decomposing cellulose and resistant to heating at 70° C. Under aerobic conditions decomposition is caused by fungi [*R.A.M.*, v, p. 763] and bacteria like *Spirochaeta cytophaga* (*Journ. Agric. Sci.*, ix, p. 143, 1919), both of which are destroyed by ten minutes' exposure to 70°.

SALMON (E. S.). **Ninth report on the trial of new varieties of Hops, 1925.**—*East Malling Res. Stat., Kent*, 31 pp., 1926.

Amongst the new varieties of hops tested in the experimental gardens of East Malling Research Station [*R.A.M.*, v, p. 1] in 1925, the Golden Hop, 341 variety proved to be entirely immune from 'mould' [mildew: *Sphaerotheca humuli*] on the leaves and cones, as was also the case with seedlings (310, X91) obtained from the cross between Golden Hop and English male hop. A brief account is given of the situation in the test plots in 1925 with regard to mosaic disease and downy mildew [*Pseudoperonospora humuli*]. As in previous years the Golding varieties became attacked by mosaic when clean stock was planted between the immune new varieties. This suggests either that the virus persists in the soil or that some of the apparently immune varieties are really 'carriers' of the disease. It is stated that the wild hops which occur so abundantly in the hedges and waste places in the hop-growing counties are now commonly infested with *P. humuli*. Seed raised from the wild hop of America (*Humulus americanus* var. *neo-mexicanus*), and from the wild hop of Canada (Manitoba), showed extreme susceptibility to this disease and the cones of the American variety, California Golden Cluster, and the German variety, Beckscher Frühhopfen, also proved susceptible.

WARE (W. M.). **Pseudoperonospora humuli and its mycelial invasion of the host plant.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 91–107, 4 figs., 1926.

The principal fact brought to light by the investigations made in 1925 of which details are given in the present paper is that the mycelium of the downy mildew of the hop, *Pseudoperonospora humuli* [*R.A.M.*, v, p. 638], may persist in underground portions of the host. Hyphae were found within the cortex and pith of the stem of 'spiked' growths from the rootstock, and also in one-year-old parts of the

latter. In the case of long bines with terminal or lateral spikes, the mycelium was found within the bine; it was not, however, always continuous, and healthy intermediate nodes and internodes frequently occurred on an affected bine. The inference from these observations is that in early spring the fungus probably invades intramatrically one or more of the developing buds on the rootstock, apparently either stunting the young shoot (in which case a basal spike would result) or being carried up by the rapidly elongating bine close behind the growing point; in the latter case, it would appear that the mycelium may either be carried up to a considerable height in its entirety or small quantities of it may be deposited at certain nodes in the course of the growth of the bine. It is pointed out, however, that up to the present the actual passage of the mycelium from the rootstock into an elongating bud has not been observed.

During the winter the mycelium was found to be present in the pith, phloem, and cortex of nursery setts, and in several cases it was also found in the cortex of the roots. Oospores occurred plentifully in the pith of terminal and lateral spikes, and within the bracts and bracteoles of the hop cones.

WORMALD (H.) & CHEAL (W. F.). **The grey mould of Hops.**—*Journ. Min. Agric.*, xxxiii, 5, pp. 456–458, 1 pl., 1926.

A brief description is given of the grey mould on the leaves and cones of hops caused by *Botrytis cinerea*, which was observed in 1924 and 1925 on the Tutsham, Cobbs, and Tolhurst varieties in four localities of Kent. The damage to the leaves was inconspicuous, but that done to the cones was of a more serious nature. Although in nature the fungus was not seen to produce sclerotia on this host, they were formed on a diseased hop kept in a moist atmosphere for a fortnight, and the authors recommend, therefore, that all cones attacked by the mould should be removed and destroyed at the harvest, to preclude the possibility of its overwintering in the fields in the sclerotial form.

GIBSON (A. P.). **Bureau of Sugar Experiment Stations. Northern Field Assistant's Report.**—*Australian Sugar Journ.*, xviii, 4, pp. 219, 225–226, 1926.

Leaf scald [*Bacterium* sp.: *R.A.M.*, v, p. 327], top rot [ibid., ii, p. 581], and the fungus which binds the leaf sheaths to the cane [ibid., v, p. 385] were observed in the Tully area of Queensland.

In the Mossman district leaf scald and leaf stripe [*Sclerospora sacchari*] (also known as 'jump-up') are the principal diseases. The B. 147, M.Q. 1, and D. 1135 varieties are most susceptible to the latter, but no variety is immune except Badila.

KELLY (N. L.). **Bureau of Sugar Experiment Stations. Assistant Pathologist's Report.**—*Australian Sugar Journ.*, xviii, 5, pp. 277–278, 1926.

It is stated that the control of sugar-cane diseases in the Mackay district of Queensland is very effective, except in the case of red rot (*Colletotrichum falcatum*) [*R.A.M.*, iv, p. 568], which was found in

July, 1926, on the M. 189, M. 1900, Q. 813, and H.Q. 426 varieties. The causal organism causes most damage in acid soils, the application to which of lime and green manure is recommended. Somewhat later planting, more thorough cultivation, and earlier harvesting may also prove useful in the control of red rot.

KELLY (N. L.). **Cane pests and diseases.**—*Queensland Agric. Journ.*, xxvi, 1, pp. 51–52, 1926.

Leaf stripe (*Sclerospora sacchari*) is stated to occur in a small part of the Bundaberg district, and in nearly every cane district north of this. The variety Q. 813 has been found to be fairly resistant. Notes on the symptoms and control of this disease are given.

A form of top rot, found mainly in M. 1900 Seedling canes around Gin Gin, was not associated with the red streak symptoms previously described [*R.A.M.*, v, p. 696] which were thought to be possibly an early stage of the disease. Of the twenty-five shoots examined, all but two (which were suffering slightly from foot rot) had normal roots, and their root pressure was comparatively strong. In this form of top rot the first symptom is a browning and putrefaction of the chlorotic areas of the younger leaves affected by 'sectional chlorosis', a common and usually harmless condition probably caused by the lodging of drops of rain or dew in the rolled young leaf. The rot then extends downwards in the young leaf towards the growing point, and also spreads to other leaves in contact with the rotted portion. The stem is then attacked a little to one side of the growing point, and if the central leaves of the bud escape for a time the top of the stem is weakened on one side only, with the result that it bends over and the condition known as knife cut [*R.A.M.*, v, p. 697] supervenes. In most cases, however, the rot spreads to the youngest leaves and the apical bud, and a true top rot results. Progress of the disease is checked by warm dry weather.

Mosaic disease is widespread in the Bundaberg district. Gumming disease (*Bacterium vascularum*) caused considerable losses in the Woongarra locality. Foot rot was prevalent, especially in the M. 1900 Seedling variety.

STOREY (H. H.). **The Cane disease situation. Urgency of the need for the control of mosaic.**—*African Sugar and Cotton Planter*, ii, 7, pp. 11–15, 1926.

Speaking at the Durban Sugar Congress [April, 1926], the writer drew attention to various important features in connexion with the control of mosaic disease of sugar-cane, figures of the losses caused by which in Hawaii are quoted [*R.A.M.*, iii, p. 608].

Mosaic is stated to have been practically eradicated on the 20,000 acres of land owned by the Natal Estates, Ltd., by constant inspection and roguing. It is believed that immediate steps for the eradication of mosaic would result in the complete elimination of the disease from South Africa, whereas any delay in such action may lead to the occurrence of an epidemic similar in extent to that of streak [ibid., v, p. 1] but vastly more destructive. As matters now stand, South Africa is thought to be the only country in which

the eradication of established mosaic is possible, and it is almost the only one which is taking no action in this direction.

As regards streak, there appears to be a more general realization of its harmful effects and a corresponding desire for its control. In the more favoured districts (chiefly Victoria County) selection and roguing will give successful control, but in Zululand and most of the south coast such methods are not likely to prove effectual. The substitution of the immune variety P.O.J. 213 (Argentine) for the susceptible Uba would be desirable but for the risk that the former (the distribution of which is now controlled by the African Explosives and Industries Co., Ltd.) would contract mosaic and assist in its perpetuation. Similar considerations apply to D. 1135 (also believed to be resistant to streak) and furnish a further argument in favour of legislation for the control of mosaic. There appears to be no likelihood of establishing strains of Uba immune from streak.

RAMSBOTTOM (J.). **Presidential address. The taxonomy of fungi.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 25–45, 1926.

The author's presidential address to the British Mycological Society, delivered at Bettws-y-Coed in September, 1924, deals at length with the complexity of the problems involved in the systematics of fungi. He reviews in some detail the older literature on the question, and analyses the present tendencies in taxonomy, and also the various definitions of the terms genus, species, Linneon, Jordanon, and the like. In particular the importance of the sub-varietal ranks is stressed. In terminating, he makes an appeal to the powers of restraint in investigators to work in such unity that Asa Gray's ideal—'Botanical classification, when complete, and correct, will be an epitome of our knowledge of plants'—may be brought nearer to accomplishment.

NAKATA (K.). **Studies on Sclerotium rolfsii Sacc. Part I. The phenomenon of aversion and its relation to the biologic forms of the fungus.**—*Bulteno Sci. Fakultato Terkultura Kjusu Imperia Universitato*, i, 4, pp. 177–190, 5 figs., 1925. [Received November, 1926: Japanese, with English summary.]

A large number of crops, especially tobacco and sugar-beet, are stated to be severely attacked by the foot rot caused by *Sclerotium rolfsii* in Japan. The present investigation was undertaken primarily to determine the systematic relationship of the fungus, and the phenomenon of aversion was studied as an aid to the delimitation of different strains. Aversion, either mutual or one-sided, was found to occur between different strains of the fungus inoculated on the same plate, but not between inocula of the same strain. The phenomenon appears to be persistent throughout all stages of growth; differences in the size of the sclerotia used as inoculum, culture media, host, temperature, and light had no visible influence. In the 47 cultures of the fungus obtained from Japan, the Philippines, Java, the East Indies, and the United States, 33 strains have been thus recognized.

NAKATA (K.). **Studies on Sclerotium rolfsii Sacc. Part II. The possible cause of the phenomenon of aversion in the fungus and morphological features of the phenomenon.**—*Bulteno Sci. Fakultato Terkultura Kyûsu Imperia Universitato,* i, 5, pp. 310–318, 1 pl., 2 figs., 1925. [Received November, 1926: Japanese, with English summary.]

Continuing his earlier investigations [see preceding abstract], the author found that the phenomenon of aversion is not due to substances formed from the medium by the action of the fungus, but to some substance secreted by the mycelium and independent of the medium. This appears to diffuse slowly, so that the submerged mycelia of the two inocula concerned are not affected until they almost meet. Sclerotia may be formed abundantly along the region where growth ceases from aversion. The aerial mycelia at this point appears to become much more slender, the hyphae having a backward curl and branching at an obtuse angle. Plasmolysis followed by disintegration was evident in the submerged mycelia at the averted region. There is apparently a direct relation between the amount of the averting substance secreted by the mycelia and the growth of the latter.

NAKATA (K.). **Studies on Sclerotium rolfsii Sacc. Part III. Perfect form of the fungus and its genetic relationships to Hypochnus centrifugus (Lév.) Tul., H. solani Prill. et Delacr., and H. cucumeris Fr. with its specific relationship to Sclerotium coffeicolum Stahel.**—*Bulteno Sci. Fakultata Terkultura Kjusu Imperia Universitato,* ii, 1, pp. 7–19, 2 figs., 1926. [Japanese, with English summary.]

Observations made by Sawada in Formosa in 1919 led to the conclusion that he had found the perfect stage of *Sclerotium rolfsii* in a fungus obtained from a diseased camphor tree, which he referred to *Hypochnus centrifugus* [*Corticium centrifugum*]. *H.* [*C.*] *solani* and *H.* [*C.*] *cucumeris* were regarded as synonyms of *H. centrifugus.* Doubts have been raised as to the identity of the fungus which he regarded as *S. rolfsii.* The author has consequently undertaken a series of morphological and cultural studies of the latter in an attempt to obtain a sporing stage and to make clear its genetic relationships to the above-mentioned species of *Corticium* and also to *Sclerotium coffeicolum* [*R.A.M.*, i, p. 16]. Thirty-three strains of *S. rolfsii* were obtained from Japan, Korea, the United States, the Philippines, Java, and the West Indies; cultures of *C. centrifugum* were got from Formosa; and of *C. solani* and *S. coffeicolum* from Holland.

During the summer of 1925 a perfect stage was obtained from three strains of *S. rolfsii,* two from Japan and one from America. These had been inoculated on the crown of sugar beet and the stem of conjak (*Amorphophallus konjac*). The close resemblance in the form and size of the spores to those of *C. centrifugum* has led the author to identify the perfect form of *S. rolfsii* as that species. A difference in colour of the mycelium and activity of sclerotium-formation was observed between *C. solani* and *C. centrifugum,* and this, together with the fact that *C. solani* has *Rhizoctonia solani* as its sterile stage, excludes the latter from relationship with *C. cen-*

trifugum. *C. cucumeris* is also not referable to *C. centrifugum*, but is considered to be identical with *C. solani*.

A comparative study of the cultural features of *S. coffeicolum*, indicates that it has a close specific relationship to *S. rolfsii*, of which it is regarded as a strain.

SMALL (W.). **Sclerotium bataticola Taub.**—*Trop. Agriculturist*, lxvii, 2, pp. 94–95, 1926.

After a brief note on the occurrence of *Sclerotium* [*Rhizoctonia*] *bataticola* in Uganda [see above, p. 14], the writer records its recent discovery in Ceylon on tea, *Erythrina lithosperma*, *Acacia decurrens*, *Tephrosia candida*, *Clitoria cajanifolia*, and *Anona muricata*, in addition to some other hosts previously listed for the former country. Observations are made on the climatic and cultural factors predisposing to attack by the fungus and on the symptoms which it produces on tea. [At a meeting of the Estates Products Committee on 8th July, 1926, it was stated (p. 103) that *R. bataticola* had since been found on coco-nut, rubber, lime [*Citrus*], and orange trees.]

SMALL (W.). **On the occurrences of a species of Colletotrichum.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 112–137, 1926.

In the present paper a representative list is given of the hosts in Uganda of a species of *Colletotrichum* morphologically indistinguishable from *C. coffeanum*, reference to which was made in a previous paper of the author [*R.A.M.*, iii, p. 509]. In addition to the hosts already enumerated, this list includes cacao (pods and twigs), cotton, beans (*Phaseolus vulgaris*), orange, chillies (a local *Capsicum*, probably *frutescens*), *Hevea brasiliensis*, bananas, figs, native raspberries, and groundnut leaves. The majority of the strains from these hosts, if not all, are regarded as conidial forms of *Glomerella cingulata*, and relationship with the latter has been proved for many of them. The statement is also made that specific names other than *C. coffeanum* might be used with equal or greater justification to designate the various forms or all of them as a whole. A study of isolated occurrences of the fungus with special regard to the hosts would therefore lead to the use of the other recognized specific names, which might be referred either to the genus *Colletotrichum* or to the genus *Gloeosporium*. In such circumstances, the form on coffee leaves and berries might be called *C. incarnatum*, that on cacao *C. incarnatum* or *C. theobromicolum*, that on tea *C. camelliae*, that on citrus, mango, and avocado pear *C. gloeosporioides*, that on chillies *C. piperatum* or *C. nigrum*, and that on papaw and figs *C. caricae*. Although this list of names might be extended to include others, it is confined for the present to those forms whose connexion with *Glomerella cingulata* has been proved. *C. gossypii* is definitely excluded from the list of possible names because the Trinidad strain of this species was found to differ consistently in pure culture from *C. coffeanum*, in the dry powdery appearance it imparted to the surface of the medium. *C. lindemuthianum* is also provisionally excluded, because, although the local fungus on French beans [ibid., v, p. 16] was indistinguishable from *C. coffeanum*, the bean pod anthracnose strain has not formed

the perfect stage and has not been compared with material from other sources.

Extensive cross-inoculation experiments were made in an attempt to find whether the various strains of the fungus are characterized by constant physiological properties which would lead to consistent behaviour and a definite relationship between them and their hosts —in other words, to the delimitation of biological strains. The results showed that the strains do not behave as physiological entities, and that they appear to be genetically unstable. A possible explanation of the latter character would be the admission of the existence of discrete physiological strains capable of different behaviour within any single isolation of the fungus.

The author considers that the use of local names for conidial forms which resemble each other strongly, and which behave in the manner of *C. coffeanum*, is to be deprecated, and that preference should be given to the conidial name *C. gloeosporioides*, which has priority among those which have a proved connexion with *Glomerella cingulata*. Distinct biological races could then be designated as forms of the conidial species, e. g., forma *camelliae*, the strain on tea being the only one of those studied by the author which showed a certain degree of selective parasitism, though even this can hardly be regarded as a true biological race.

KILLIAN (C.). **Études biologiques du genre Ramularia.** [Biological studies of the genus *Ramularia*.]—*Ann. des Épiphyties*, xii, 3, pp. 147–164, 5 pl., 1926.

In the present paper the author records at some length his observations on the biological and anatomical characters of the following species of *Ramularia*: *R. saxifragae*, parasitic on *Saxifraga granulata*; *R. variabilis* on *Digitalis purpurea*; *R. lapsanae* on *Lapsana communis*; and *R. parietariae* on *Parietaria officinalis* and *P. ramiflora*. The first two, inhabiting biennial plants, produce conidia as well as sclerotia during the winter; the third, on an annual plant, hibernates as sclerotia only; while the last, occurring in southern regions, has no sclerotia and forms conidia all the year round. Local necrotic lesions are produced by all except *R. lapsanae*, which causes wilting. In this species the conidiophores are formed in the sub-stomatal cavities and do not cause the epidermis to become ruptured. In most other species of the genus they break through the epidermis, but in *R. variabilis* both types occur. In some species of *Ramularia* perithecia are known to be commonly produced and to form normal ascospores (*R. knautiae*, *R. hieracii*), while in others the perithecia are rare (*R. tulasnei*, *R. variabilis*), or absent (most species), though in several of these there are indications of the commencement of perithecium-formation, ceasing, however, before asci are developed. In *R. saxifragae* and many others the sclerotia have the power of developing conidiophores. Pycnidia are formed in *R. variabilis* by the development of sclerotium-like bodies under the epidermis and the production of small elongated spores in the central cavity in these. In this species the perithecia are 100 μ in diameter and contain clavate asci with 8 bicellular, somewhat pointed ascospores, 6 to 9 by 1 μ in diameter. Cultures from the ascospores gave the

conidial stage. The name *Mycosphaerella variabilis* is proposed for the perfect stage of this species. The characters of the conidia do not present any outstanding differences in the four species discussed in this paper.

BLUMER (S.). **Neue Wirtspflanzen von Mehltaupilzen.** [New host plants of Erysiphaceae.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxvi, 7-8, pp. 232–236, 1926.

Referring to the researches of various workers on the biology of the Erysiphaceae, the writer records some recent data on the occurrence of species of *Erysiphe* on new hosts, and considers it hardly possible that these can be merely cases that were overlooked by the earlier observers. At the Berne Botanic Garden a strain of *E. cichoracearum* was observed on *Plantago asiatica*, from which it was readily transmissible to the closely related *P. major* by inoculation. An *Oidium* occurring on *Sonchus jacquini* (a woody species from the Canary Islands) was similarly transmissible to *S. oleraceus*, *S. asper*, and *S. arvensis*. In such cases it is evident that the fungus has passed from a native to the foreign host. A strain found on *Veronica gentianoides* in 1923 is thought to be possibly identical with that often observed on *V. chamaedrys* in the vicinity of Berne.

Mayor found *E. polygoni* on carrot, and on the supposition that the mildew spread from another member of the Umbelliferae a much weaker degree of specialization than that indicated by Hammarlund [*R.A.M.*, iv, p. 431] must be assumed. Other noteworthy records for Switzerland include *Sphaerotheca humuli* on *Sorbus* [*Pyrus*] *aria* and *E. polygoni* on *Papaver dubium* and *Robinia pseudacacia*. According to Ducomet [ibid., i, p. 361], an *Oidium* presumably belonging to *E. cichoracearum* attacks potatoes and beets in western France.

A plant of *Hydrangea hortensis* belonging to the author was heavily infected by mildew in 1925, and later the disease spread to two adjacent plants. The identity of this *Oidium* remains obscure, since the perithecial stage was not observed. Large spots were formed on both leaf surfaces and on the stems, and one of the plants was killed in a month. The conidiophores bore chains of three to eight conidia, measuring 29 to 32 by 12 to 15 μ. Attempts to inoculate other plants with the *Hydrangea* mildew were unsuccessful. The conclusion is drawn that the Erysiphaceae are by no means so strictly specialized as indicated by Hammarlund's researches, and the suggestion is made that more extensive and prolonged experiments would probably extend the range of the organisms. Attention is further directed to the fact that the Erysiphaceae can often attack plants that are in a temporarily receptive condition while failing to infect normal organs, as for instance in the case of *Podosphaera oxyacanthae* var. *tridactyla* on cherry-laurels [*Prunus laurocerasus*] damaged by frost.

DUKE (M. M.). **Fungi from Kenya Colony.**—*Kew Bull. Misc. Inform., 1926*, 8, pp. 305–320, 1 fig., 1926.

This is a preliminary list of about 150 species of fungi, many of which are associated with, or pathogenic to, cultivated crops in

Kenya Colony. The fungi are listed according to their systematic position, and in some cases notes on their prevalence and economic importance are given.

D'ANGREMOND (A.). **Jaarverslag van het Proefstation voor Vorstenlandsche Tabak 1 Mei 1924–30 April 1925.** [Annual Report of the Experiment Station for Vorstenland Tobacco, 1st May, 1924, to 30 April, 1925.]—*Proefstat. Vorstenlandsche Tabak, Meded.* 55, pp. 31–58, 1926.

The following references of phytopathological interest are included in this report.

In two field experiments to test the effect of different kinds of manure on the incidence of *Phytophthora nicotianae* in the Vorstenland tobacco plantations, the following figures were obtained: 'dessa' manure [*R.A.M.*, iii, p. 434], 86·25 and 50·30 per cent. infection; fermented rice straw, 15·37 and 4·87 per cent.; the same plus double superphosphate, 13·37 and 4·0 per cent.; and control 10·25 and 5·0 per cent.

The application of sulphur at the rate of two piculs [about 125 kg.] per bouw [approximately 0·71 hect.], which had previously given good control of mildew (*Oidium* sp.) [*R.A.M.*, iv, p. 131], was less successful during the period under review, presumably owing to the unusual weather conditions.

Circulars 14, 15, and 23, the first two dealing with *P. nicotianae* and the third with *Oidium*, are appended to the report.

BEWLEY (W. F.) & WHITE (H. L.). **Some nutritional disorders of the Tomato.**—*Ann. of Appl. Biol.*, xiii, 3, pp. 322–338, 1 col. pl., 5 figs., 1926.

The true so-called 'blotchy ripening' of tomato fruits is characterized by the indiscriminate formation of hard green areas in otherwise ripe fruits. There is no abrupt line of demarcation between the green and red areas, and the colours merge gradually. The condition is distinct from the irregular ripening caused by attacks of *Bacillus lathyri* (stripe disease), where the fruit shows sunken, brown, irregular pits and markings; from aucuba mosaic, where the marks are sharply defined and the colours are different; and from the condition known as 'green back', which is a green hardening confined to the stalk end while the rest of the fruit softens and turns red. Investigations as to the cause of true blotch have shown that it is the direct result of malnutrition due to a deficiency of potash and nitrogen, especially the former. Phosphate deficiency seems to be unimportant in its causation. Blotchy ripening may be accompanied by necrosis of the vascular bundles of the fruit and the breaking down of the adjacent parenchyma, which results in the formation of cavities or canals. The symptoms are most severe about June and July; fruit from the same plants may be free from blotch later in the season. In regard to varietal behaviour, experiments at Cheshunt have shown that the variety Kondine Red is decidedly susceptible to this defect, producing sometimes as much as 46·9 per cent. of blotched fruit.

The results of manurial treatments [full details of which are given] clearly indicate that the application to affected plants of

potassic and nitrogenous fertilizers causes a corresponding reduction in the quantity of fruits affected. Other factors evidently play some part in the incidence of this disorder, as even under the most favourable manurial conditions a small number of blotchy fruits are produced. Sunlight appears to be one of these factors. Root fungi such as *Colletotrichum tabificum* [*C. atramentarium*: *R.A.M.*, v, p. 182] interfere also with plant nutrition and indirectly cause blotchiness on well-manured plots. Severe cases have also been traced to dryness of the soil below the top six inches.

Susceptibility to the stalk-end 'green back' disease seems to have somewhat the same relation to nutritional deficiencies, but the ultimate symptoms seem to be intensified by exposure of the fruits to excessive sunlight.

Distinctive colour changes are brought about in the leaves of tomato plants by a deficiency of nitrogen or potash. In the former case the leaves develop pale yellow blotches between the veins, which ultimately spread over the whole leaf. When potash is deficient, leaf scorch, characterized by the margins of the leaf turning pale and gradually drying up, results.

BRUSSOFF (A.). **Das Uebergreifen des Micrococcus ulmi auf Ahorne und Linden.** [The spread of *Micrococcus ulmi* to Maples and Limes.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxvi, 9–10, pp. 269–274, 1926.

During the summer of 1926 a disease of silver maples (*Acer dasycarpum*) and lime trees (*Tilia intermedia* and *T. platyphyllos*), the symptoms of which were strikingly reminiscent of that previously investigated by the author on elms [*R.A.M.*, iv, p. 382], was observed at Aix-la-Chapelle.

The macroscopic and microscopic symptoms of the disease on both hosts are described. On maples there is frequently little external alteration. Transverse sections through the branches showed dark spots in the annual rings of the wood and near the medulla. The dark coloration shaded off to pale brown and light reddish-yellow streaks, which could be traced for a distance of 30 to 35 cm. above the spots. Sections through some of the roots also showed yellow spots or semicircular lines in the wood, while others appeared quite healthy.

Microscopic examination revealed the presence in the vessels of a dark brown or red to pale yellow, granular substance, similar to that observed in diseased elms [loc. cit.], and containing hyaline cocci and diplococci.

The external appearance of diseased limes (*T. intermedia*) approximated more closely to that of the elms. The leaves on some of the branches were withered and greyish-green or brown. Transverse sections showed conspicuous spots in the wood, sometimes forming an almost continuous semicircle in the last annual ring. On the removal of the cortex from a diseased branch two broad, greyish-brown stripes were observed to extend along the branch and into the twigs. Several yellowish-brown spots were seen in a root of the same tree, chiefly in the annual rings of 1922–24. A section through the trunk and root of a completely

defoliated lime (*T. platyphyllos*) showed a large, brown spot which was continued in the form of broad, lobate rays from the old to the young wood, and reached the cortex in places. The medullary rays showed a dark discoloration and the periphery of the spot was marked with dark brown points and short, narrow lines.

Microscopic examination revealed in this case also the presence of a brown homogeneous or granular substance occurring in the form of short plugs in the vessels and many of the tracheids and containing cocci and diplococci.

From the diseased tissues the writer isolated an organism which was found to be identical with *Micrococcus ulmi*. Details of the technique of isolation and cultural methods are given. A conspicuous feature of the cultures on various solid media is the bluish-green iridescence of the colonies.

The author concludes from these observations that the newly observed disease of maples and limes is, like the so-called Dutch elm disease, due to the activity of *M. ulmi*.

WILSON (M.) & WALDIE (J. S. L.). **An epidemic disease of the Oak.**—*Gard. Chron.*, lxxx, 2067, p. 106, 1926.

During 1925, and again in 1926, a disease causing extensive damage to oak (*Quercus pedunculata*) was observed in several localities of central and southern Scotland, resulting in death of the leaves and, in some cases, premature defoliation. Reference is made to the authors' note published in the *Trans. R. Scottish Arbor. Soc.*, xxxix, p. 206, 1925, in which the symptoms were described and the disease was attributed to *Sclerotinia candolleana*.

The leaves show light brown areas of dead tissue, usually rounded and about $\frac{1}{4}$ inch across, but sometimes irregular and spreading over the greater part of the leaf. Under moist conditions numerous black, rounded sclerotia, about $\frac{1}{8}$ inch across, are produced during the winter on fallen leaves and the authors also obtained sclerotia in pure cultures of the fungus. The perfect stage develops from the sclerotia in the spring and early summer of the year following their formation. A thread-like stalk grows out and bears a small, flat, reddish cup, about $\frac{1}{8}$ inch across, which produces asci and spores. The latter infect the leaf surfaces, and a yellowish spot is formed which turns brown as the underlying tissues die. Examination of the latter shows that the hyphae penetrate in all directions. No conidia have been seen.

The disease is confined entirely to the leaf, and the collection and burning of fallen leaves should remove all sources of infection.

KONOPACKA (WANDA). **Nowy pasorzyt Buka—Moniliopsis fagi nov. sp.** [A new parasite of the Beech—*Moniliopsis fagi* n. sp.]—*Choroby i Szkodniki Roślin* [*Diseases and Pests of Plants*], Warsaw, ii, 1, pp. 12–21, 1 pl., 1926. [English summary.]

A brief description is given of a leaf blight of the beech (*Fagus sylvatica*) which is stated to occur year after year in a

densely shaded and damp dale in the valley of Ojców [Poland], a locality to which it appears to be restricted. The disease was first noticed by Siemaszko in 1924 and attributed to *Moniliopsis foliicola*, the beech being regarded as a new host for this fungus [*R.A.M.*, iv, p. 507].

In a careful morphological and cultural study [details of which are given] the author, however, found that the beech organism differs from *M. foliicola* in the structure of its sterile clusters of mycelium (pseudosclerotia), in the capacity of the latter to germinate when cut into pieces or even when reduced to separate hyphae or cells, in its growth only as mycelium on artificial media without forming microconidia, and in the fact that it does not produce oxalates in pure cultures. Further, in inoculation experiments the organism from the beech failed to infect the leaves of hazel nut [*Corylus avellana*], black alder [*Alnus glutinosa*], and lime [*Tilia*], while the fungus from the latter failed to attack the beech. The author considers, therefore, that the beech fungus should be separated as a new species, which she names *M. fagi*, and of which a Latin diagnosis is appended.

S[CHENK] (P. J.). **Platanenziekte en koude.** [Plane diseases and cold.]—*Floralia*, xlvii, 29, pp. 456–457, 2 figs., 1926.

Plane trees [*Platanus*] in Holland have for the past few years been suffering severe damage from *Gloeosporium nervisequum* [*R.A.M.*, iv, p. 210; v, p. 11] which appears to be constantly associated with low temperatures and night frosts in May. At Whitsuntide (1926) the writer observed the typical symptoms of the disease in Belgium, Luxembourg, Alsace-Lorraine, and on the Swiss frontier. The cold weather is regarded as being a contributory factor in the development of the disease.

KALSHOVEN (L. G. E.). **Beschadigingen, ziekten en plagen van Mahonie (Swietenia mahagoni en S. macrophylla), aangeplant op Java.** [Injuries, pests, and diseases of Mahogany (*Swietenia mahagoni* and *S. macrophylla*) cultivated in Java.] —*Meded. Inst. voor Plantenziekten* 69, 126 pp., 22 pl., 1926. [English summary.]

It could not be definitely ascertained whether a die-back of seedlings of mahogany (*Swietenia macrophylla*), observed in Java in 1918, was due to fungous infection or to the effect of heat. The latter factor is regarded as the more probable, though *Rhizoctonia solani* is believed to cause similar symptoms.

Branches or saplings of both *S. mahagoni* and *S. macrophylla* are sometimes killed by *Corticium salmonicolor*, which may cause cankers extending to the wood and may also girdle the branch.

In an experimental area previously covered with mixed primeval forest, some ten-year-old *S. macrophylla* trees were destroyed by the brown root fungus (*Fomes lamaoensis*) [*R.A.M.*, iv, p. 594], and the gap thus created is spreading annually. The root collar decays at the base, showing the soil crust penetrated by hyphae typical of this disease. Other observations indicate that *S. mahagoni* is also susceptible to the attack by this fungus. The application of

a fungicide to the root collar is recommended, since isolation of the affected trees by trenches does not appear to give adequate control.

Quarantine on account of the White-Pine blister rust. Notice of quarantine No. 63, with regulations.—*U.S. Dept. of Agric., Fed. Hort. Board Leaflet*, 6 pp., 1926.

In order to prevent the spread of white pine blister rust (*Cronartium ribicola*), no five-leaved pines (*Pinus*) shall be moved, as from 1st October, 1926, from any of the 31 eastern United States [which are enumerated] or the District of Columbia into any State lying west of the line formed by the western boundary of the States of Minnesota, Iowa, Missouri, Arkansas, and Louisiana, or from the following areas into any other State: (1) Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; (2) the State of New York; (3) Minnesota and Wisconsin (except into the areas comprised in (1) and (2); (4) Michigan, New Jersey, and Pennsylvania (except into the areas comprised in (1), (2), and (3); the State of Washington; and certain counties of the State of Oregon. Five-leaved pines shall not be removed without a permit into any legally established blister rust control area set aside for the cultivation of currants and gooseberries.

European black currant plants (*Ribes nigrum*) shall only be moved inter-State within the area comprised by the States of Alabama, Arkansas, Florida, Kansas, Louisiana, Mississippi, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas. Except in compliance with certain [specified] provisions, currant and gooseberry plants other than European black currants shall not be moved to points outside the following infected States: Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, and Wisconsin. The certificate, marking, and permit requirements governing the transportation of five-leaved pines, European black currants, and other currant and gooseberry plants from the 14 above-mentioned infected States and from other States are enumerated. Provision is made for the inspection, at the point of shipment or destination, of all inter-State shipments of nursery stock or other plants.

Die Pflanzenschutzbestimmungen für die Einfuhr, Ausfuhr und Durchfuhr lebender Pflanzen und frischer Pflanzenteile im Deutschen Reich. [The plant protection regulations for the import, export, and transport of living plants and fresh portions of plants in the German Republic.]—Reichsdruckerei, Berlin, 111 pp., 1926.

This is a compilation, prepared by Dr. Martin Noack, of the Biologische Reichsanstalt, at the instance of the Ministry of Food and Agriculture, of the past and present regulations for the import, export, and transport of living plants in the German Republic. The regulations of the provincial Governments are included only in so far as they supplement those of the Republic or are concerned with matters of outstanding importance.

IMPERIAL BUREAU OF MYCOLOGY

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ALCOCK (Mrs. N. L.). **Successional disease in plants as shown in Willow rods.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 161–167, 1 pl., 1926.

This is a somewhat expanded version of a paper by the author in collaboration with Miss Iris Maxwell noticed from another source [*R.A.M.*, iv, p. 516]. The main purpose of the author in reproducing it was to show, by the example of the succession of the three diseases of the crack willow (*Salix fragilis*), caused, respectively, by *Cryptomyces maximus*, *Scleroderris fuliginosa* and *Myxosporium* (*Cryptosporiopsis*) *scutellatum*, how one disease can lead to another, and how a plant in a weakened condition ceases to have the full power of resistance to a particular fungus.

MCCUBBIN (W. A.). **White Pine blister rust.**—*Pennsylvania Dept. of Agric. Bull.* 426, 25 pp., 3 pl., 1926.

After a brief reference to the introduction and spread of white pine blister rust (*Cronartium ribicola*) in the United States, the author describes the situation in regard to the disease in Pennsylvania. The inspection service initiated in 1916 in this State has done much to prevent infection spreading locally from imported pines. Until 1921, no case of rust on *Ribes* was reported, and in succeeding years, up to and including 1925, the disease does not appear to have spread to any appreciable extent from Wayne County, where alone it became established. A slow spread southward is, however, considered almost inevitable. Quarantine restrictions, imposed in 1924, prohibit the introduction of five-needled pines or black currants from outside the State, except from New Jersey. The symptoms of the disease on pines and *Ribes* are described and a summary of the life-history of the fungus is given. Local control measures must be based on the eradication of *Ribes* in the pine areas and for a distance of 300 yards around them, while cultivated black currants should be kept half a mile away.

CHAPMAN (H. H.). **Factors determining natural reproduction of Longleaf Pine on cut-over lands in La Salle Parish, Louisiana.** —*Yale Univ. School of Forestry Bull.* 16, 35 pp., 12 figs., 1926.

Longleaf pine (*Pinus palustris*) is usually resistant to fire after the age of two years, the thick bark and bud protection enabling very young trees to survive fires which destroy all the needles. It is, however, susceptible to needle blight (*Septoria pini*), which is serious during unusually wet years. The needles, which normally persist for three years in a green condition, are killed by the fungus as soon as they are formed. The disease does not flourish on shaded specimens. It attacks vigorous individuals as readily as enfeebled ones, and kills them just as quickly. During the early rosette type of growth characteristic of this pine species there is little damage, but after height growth commences the trees are very susceptible until they reach a height of 3 to 5 feet. The frequent light fires on typical longleaf pine sites are believed to have kept the disease in check by destroying the fungus over wide areas. Defoliation by the fungus kills trees if repeated for three successive seasons, and weakens trees more rapidly than do spring fires.

HART (W. C.) & RENGASWAMY (S.). **Preliminary investigation into the cause and cure of the spike disease in Sandal (Santalum album) in the North Salem Division, Madras Presidency.**—*Indian Forester*, lii, 8, pp. 373–390, 1 diag., 1 map, 1926.

Spike disease of sandal (*Santalum album*) [*R.A.M.*, iv, p. 452] is stated to have spread to an alarming extent in the North Salem district of Madras since its discovery in 1913, the area affected having increased from 30 to 20,000 acres. The disease has been treated by the removal of all spiked trees. As the number of sapwood trees removed [the trees are relatively worthless until they have formed heartwood] from 1917 to 1925 was 98,734, the ultimate loss from the control measures in these years is calculated at nearly 47 lakhs of rupees [about £352,500]. In certain areas the prompt removal of infected individuals in 1922 appears to have resulted in the eradication of the disease, no return of which has been observed.

The results of observations in demarcated spike areas showed that the spread of the disease is from south-west to north-east, i. e., in the direction of the prevailing monsoon winds at flowering time. The minimum girth of the trees so far found affected in one of the areas inspected is half an inch. The ratio of diseased trees in an area cleared of *Lantana* to that in an area not so cleared was 3 to 5. In one plot which contained 341 healthy sandal trees in 1916 there are now only 21 free from disease.

It has been shown that sandal is cross-fertilized from one tree to another. In support of the theory that infection is transmitted by pollen from spiked to healthy trees, it is stated that all the diseased seedlings examined showed signs of previous flowering. It was found impossible to produce spike in sandal by grafting spiked *Zizyphus* on to it and vice versa.

The removal of early spiked branches has not proved effective in

checking the disease, and no definite indication was obtained that spike is promoted by drought.

A list of the insects collected from healthy and diseased trees in spiked areas is given, in view of the possibility that infection is insect borne.

MacLean (J. D.). **Effect of temperature and viscosity of wood preservative oils on penetration and absorption.**—*Proc. Amer. Wood-Pres. Assoc., 1926*, pp. 147–167, 6 graphs, 1926.

Experiments conducted at the Forest Products Laboratory, Madison, Wisconsin, with railway sleepers of Douglas fir [*Pseudotsuga taxifolia*] and hemlock [*Tsuga* sp.] have indicated the existence of a distinct connexion between absolute viscosity, which is a function of temperature, and the penetration and absorption of timber preservatives. For a given species and treatment with oil preservatives in general or in particular, this relation can apparently be expressed by a mathematical equation.

Although the sleepers treated with creosote had an appreciably higher moisture content than those treated with mixtures of creosote and oil, in almost every case the creosote gave the best penetrations and absorptions at each of the temperatures used (160° to 235° F.). An average for all the treatments made with a given preservative showed that the absorption obtained with the creosote was about 10 per cent. greater than that secured with the mixture of 50 per cent. creosote and 50 per cent. petroleum oil, and about 25 per cent. greater than that obtained with the mixture of 10 per cent. creosote and 90 per cent. petroleum oil. The corresponding average side penetration secured with creosote was more than 11 and 23 per cent., respectively, greater than those obtained with the two mixtures.

Fluctuations in viscosity arising from a given temperature change at the higher temperatures used had a much greater influence on penetration than the large changes in viscosity produced by equal differences in temperature at the lower range.

Treatments of hemlock specimens in which the temperature of the mixtures was raised to give them the same viscosity as that of creosote at 160° F. showed that somewhat better penetration occurred at the higher temperatures. This is attributed largely to the fact that the hotter oils heated the wood more rapidly and to a greater depth during the pressure period, thereby producing more favourable conditions for penetration.

Coolidge (J. R.). **Treatments with Montan wax.**—*Proc. Amer. Wood-Pres. Assoc., 1926*, pp. 183–191, 1926.

Montan wax, a derivative of lignite, appears to be the most promising of the many substances tested for admixture with creosote in order to effect the solidification of the oil within the cells of treated wood without impairing its toxic properties. It was recently shown that montan wax (which is stated to be readily available in the United States at prices ranging from 4·5 to 6 cents per lb.) can be used commercially in admixture with creosote for the preservation of southern yellow pine [*Pinus palustris*] poles by the

following processes. (1) Rüping [*R.A.M.*, v, p. 397]: 60 per cent. montan, 40 per cent. creosote; initial air 60 to 80 lb.; pressure gradually raised to maximum (180 to 200 lb.) and held about five hours; temperature 225° F.; final steaming and vacuum optional; complete penetration of sapwood; net absorption 3·5 to 4·5 lb. per cu. ft.

(2) Any standard empty cell process designed to leave 3 to 4 lb. creosote oil per cu. ft., followed by a vacuum period of about 30 minutes, after which liquid montan wax is introduced. When the charge is covered, the cylinder is vented and the charge left in the preservative for about 15 minutes at 240° F. Net absorption 0·5 to 1 lb. montan per cu. ft. The proportion in this process should be 80 per cent. creosote and 20 per cent. montan.

(3) As in (1) but at a temperature of only 185°; or as in (2) but at a temperature not exceeding 200°. Montan may be used alone or in any proportion with creosote, 10 per cent. of the weight of the preservative in safety solvent being added.

Montan wax can also probably be combined with substances other than creosote for preservative purposes, e. g., with petroleum oil and a toxic agent where absolute cleanliness and freedom from odour are required.

WOOD (G.). **Beta naphthol as a wood preserver.**—*Proc. Amer. Wood-Pres. Assoc., 1926*, pp. 100–111, 1 graph, 1926.

It has been shown [*R.A.M.*, v, p. 398] that the toxicity of creosote oil depends on the fraction distilling below 270° C. The boiling-point of beta naphthol [loc. cit.] is 286°. This preparation has been found, in experiments carried out at the Forest Products Laboratory, to be 17·5 times as toxic to *Fomes annosus* as zinc chloride. Pine oil is the only oil which has hitherto been found to raise the solubility of beta naphthol in gas oil. There appears to be every prospect of the successful treatment of constructional timber with a combination of 3 per cent. beta naphthol, 10 per cent. pine oil, and 87 per cent. gas oil.

MAIER-BODE (H.). **Versuche mit Antinonnin.** [Experiments with antinonnin.]—*Nachr. über Schädlingsbekämpf.*, i, 3, pp. 152–157, 3 figs., 1926.

The writer has obtained excellent control of the dry rot fungus (*Merulius lacrymans*), as well as of *Polyporus vaporarius* (which is stated to come next in order of prevalence in timber rots in Germany) [see also *R.A.M.*, v, p. 396], with antinonnin, a yellowish-brown, practically odourless paste, of which the effective principle is potassium orthodinitrocresolate. The application of a 2 to 3 per cent. solution of antinonnin prevented the development of *M. lacrymans* on boards and the like, while the addition of varying amounts (0·033 to 1 per cent.) to gelatine cultures of the fungus also inhibited the growth of the mycelium. The spores of *P. vaporarius* failed to germinate on wood treated with 2 per cent. antinonnin and the mycelium also made no growth. Antinonnin was also found effective against moulds on walls.

SIMONET (M.). **Principales maladies des plantes potagères.** [Principal diseases of kitchen garden plants.]—*Bull. Soc. Agric. de France*, lviii, 9, pp. 245–251, 1926.

Some of the principal fungous, bacterial, and physiological diseases of kitchen garden plants in France are enumerated under their respective hosts, with brief notes on their symptoms and control.

VAN DER MEER (JIKKE H. H.). **Rhizoctonia- en Olpidium-aantasting van Bloemkoolplanten.** [*Rhizoctonia* and *Olpidium* infection of Cauliflower plants.]—*Tijdschr. over Plantenziekten*, xxxii, 8, pp. 209–242, 2 pl., 5 figs., 1926. [English summary.]

In May, 1925, cauliflower plants of the Haagsche Vroege variety in a market garden near Utrecht were found to be suffering from a peculiar disease, characterized by arrested growth of the seedlings after transplanting and poor development of the root system. Most of the plants recovered by June, and consequently there was little financial loss from the disease.

The microscopic examination of the yellowish-brown roots of affected plants showed the presence, in 11 out of 13 cases, of a species of *Olpidium* (probably *O. brassicae*) [*R.A.M.*, iii, p. 311] in the epidermis, accompanied in five of the plants by a strain of *Rhizoctonia* which was shown by cross-inoculation experiments to be physiologically distinct from that occurring on potato (*Hypochnus* [*Corticium*] *solani*). When seedlings were planted in pots filled with soil from the infected plots they showed symptoms of disease, all being infected by the *Olpidium*, while some were attacked also by *Rhizoctonia*. Soil contamination with two different isolations of the cauliflower *Rhizoctonia* resulted in the death of most of the plants in the pan soon after germination.

Olpidium being an obligate parasite, it was necessary to use living plants germinated in aseptic conditions in order to secure cultures of this fungus. A method is described by which such cultures free from other fungi were obtained. Several inoculation experiments showed that infection by *Olpidium* caused a yellowish discoloration of the cauliflower roots, unaccompanied by rotting, and a slight delay in the growth of the seedlings. The total weight of 130 inoculated plants was 638 gm. compared with 831 gm. for the same number of controls. Soil humidity was shown to be a predisposing factor to infection by *Olpidium*. The fungus was found to occur sporadically in the roots of *Chenopodium album* and beet growing in the same fields as the diseased cauliflowers. Cabbage from several localities was also found to contain *Olpidium* in their roots.

The writer carried out a study of the mode of infection of roots by *Olpidium*, the optimum temperature for which was ascertained to be between 15° and 20° C. Roots of three sterile cauliflower seedlings were placed in drops of sterile water containing vigorous zoospores of the fungus at a temperature of 20°. After an hour some zoospores, measuring 3 μ in diameter, were still moving, but forty minutes later most had come to rest, many being on the surface of the root hairs. Four hours and ten minutes after inoculation the

contents of two of the zoospores were observed entering the root hairs, leaving empty spore-cases behind. Forty-five minutes later the protoplasm of the fungus inside the root hair wall was suddenly borne downwards by the protoplasm of the host, disappearing in fifteen minutes into the epidermal cell at the base of the root hairs. The writer proposes the term 'prosporangium' for this phase in the life-cycle of the fungus, in analogy with Miss Curtis's name of 'prosorus' for the initial stages of *Synchytrium endobioticum* [*R.A.M.*, i, p. 80]. After 24 hours the prosporangia measured from 8 to 13 μ, while after about 48 hours sporangia were observed, some round, from 20 to 27 μ in diameter, with necks and hyaline protoplasm, and others elongated and full of zoospores. In a second experiment the period elapsing between the first indication of penetration and the appearance of the prosporangium free within the hair was 19 minutes. Entry was effected through a very minute canal. In this case the time from the first infection to the formation of a fresh generation of zoospores was 44 hours.

It was ascertained that the *Olpidium* zoospores were unable to enter the epidermal cells of the host directly, and penetrated only through the root hairs. Unlike Woronin's description of *O. brassicae* the cells of the hypocotyl were never attacked. Resting spores were not seen.

LINFORD (M. B.). **Black-leaf of Peas caused by Fusicladium pisicola n. sp.**—*Phytopath.*, xvi, 8, pp. 549–558, 2 pl., 1926.

In the summer of 1921 a destructive leaf spot disease, which has been termed black leaf, was observed for the first time in fields of canning peas at Smithfield, Cache County, Utah [*R.A.M.*, iv, p. 593]. It is now known to occur also in the Ogden and Weber Valleys of Utah and in the Snake River Valley of Idaho.

Affected plants are characterized by the almost simultaneous development of small, irregular, whitish areas, measuring 1 to 7 mm. across, on the lower surface of leaflets and stipules, and of slightly paler areas on the upper side. The spots on the lower side expand, developing tan-coloured centres and eventually darkening centrifugally through grey to sooty black, this process coinciding with the formation of a layer of densely packed conidia of a species of *Fusicladium*. The spots, the centres of which may turn grey or olive-grey after the disappearance of the conidia, are limited laterally by the primary and secondary veins, but longitudinally they may increase indefinitely. After the shedding of the conidia, which occasionally develop also on the upper side of diseased spots, the latter become dry and may fall out. At this stage a bluish-grey zone, composed of minute pycnidia, develops around and sometimes within the conidial areas. In advanced stages of the disease the tendrils may be completely girdled and the petioles may bear elongated spots.

The disease usually occurs on plants approaching full blossom, infection spreading upwards from the lower leaves. Hitherto it has been of negligible economic importance. The White Admiral appears to be the most susceptible variety, while Horal, Champion of England, Green Admiral, Alaska, and Marrowfat are also liable to infection.

The morphology of the causal organism, which has been named *F. pisicola* n. sp. (with an English diagnosis), is fully described. The slender, sparsely branched, septate mycelium is strictly intercellular, but haustoria were not seen. The conidiophores are erect, continuous, conical, the walls thickened and dark brown at the truncate apex, and measure 10 to 24 by 4 to 6 μ (at the apex). The solitary, brown conidia are ovate to cylindrical, measuring 16 to 32 by 8 to 14 μ, rounded at the ends or truncate at the base, generally becoming uniseptate, and having finely granular walls. Cultures were not obtained, though the conidia germinated freely on various media, especially when kept at 17° C. Inoculation experiments with the conidia failed to cause infection.

In addition to the above-mentioned pycnidia, which are spherical to ovoid, measuring 60 to 70 μ and containing pycnospores, 1·3 by 5 μ in diameter, sclerotial bodies, measuring 75 to 90 μ, were observed to develop around the conidial areas. Both microscopic examination and field observations suggest that the pycnidia (which evidently belong to a new species of *Phyllosticta*), sclerotial bodies, and conidia represent different stages in the development of the same fungus.

The available evidence suggests that there is little likelihood of the introduction of black leaf into fresh localities with seed from infected fields.

CARSNER (E.). **Susceptibility of the Bean to the virus of Sugar-Beet curly top.**—*Journ. Agric. Res.*, xxxiii, 4, pp. 345–348, 1 fig., 1926.

This is a fuller account of the author's experiments, a summary of which has already been noticed [*R.A.M.*, v, p. 272], in demonstrating the susceptibility of beans (*Phaseolus vulgaris*) to the virus of sugar beet curly top. Of the seven bean varieties tested, Black Valentine seemed to be the most susceptible, while Montana White (Great Northern) was but slightly injured and the others were intermediate. A statement by Severin that many varieties of field beans, as well as a large number of other crops, were affected by curly top under natural conditions in California in 1925 is quoted. The vector (*Eutettix tenella*) does not thrive on beans, and it is suggested that this food plant is made use of by the insects only when they are unusually abundant. If so, it is unlikely that the disease will become a continual menace to beans, as it is to sugar beets.

ZUTAVERN. **Wurzelbrand bei Rüben.** [Root rot of Beets.]—*Deutsche Landw. Presse*, liii, 27, p. 342, 1 fig., 1926.

The writer's recent investigations of root rot of beets at Landsberg-an-der-Warthe have shown that *Phoma betae* and other fungi associated with this disease are of secondary importance to the condition of the soil [*R.A.M.*, iv, pp. 327, 583; v, p. 342]. In 1925 root rot caused heavy damage in a field of sandy clay with a P_H value of 6·3 to 6·6, while in one of clay sand (P_H 7·0 to 7·3) the plants remained perfectly healthy. The yield of the former plot was 130 cwt. per acre, compared with 180 cwt. from the latter. The writer is of opinion that seed-cluster disinfection is of little

value in the control of root rot, which can only be remedied by the adjustment of the soil reaction to neutral point. Lime should be applied in adequate quantities and Chile saltpetre and kainit replaced by calcium nitrate and potassium nitrate. Incrustation of the soil must be most carefully avoided.

GRAM (E.). **Afsvampningsundersøgelser. II. Forsøg med Runkelroe- og Sukkerroefrø 1920–1925.** [Investigations on seed disinfection. II. Experiments with Mangold and Sugar Beet seed 1920–1925.]—*Statens Forsøgsvirksomhed i Plantekultur Beretning* 197, 66 pp., 7 figs., 1 graph, 1926. [English summary.]

In this paper [which is also published in *Tidsskrift for Planteavl*, xxxii, 3, pp. 337–402, 1926], a full account is given of the experiments conducted during 1920 to 1925 at various Danish experiment stations in the control of root rot (*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*) and heart or dry rot (*P. betae*) of mangolds and sugar beets by seed disinfection.

Root rot was prevalent in both crops in six years of the period 1906–25, the last occasion being in 1923. When May is cool and wet, causing incrustation of the soil, infection may be severe enough to necessitate resowing, and losses approximating to half the crop may be sustained. No correlation was found between the incidence of infection in the seed lots and the intensity of root rot; even heavily infected seed may germinate well and give a satisfactory stand. The decisive factor in the etiology of the disease, in addition to the above-mentioned fungi, appears to be the retardation of development caused by cold, soil incrustation, or a deficiency of lime or other nutrient substances.

Heart or dry rot was prevalent in seven seasons during the last twenty years, the last time being in 1925. The virulence of *P. betae* in the causation of this disease has been found to be strictly dependent on the dryness and alkalinity of the soil; in a preliminary survey no infection was found on clay soils with a hydrogen-ion concentration below P_H 7·7 [see also *R.A.M.*, iv, p. 522 and preceding abstract]. Seed disinfection failed to prevent the development of heart rot.

The technique of the seed disinfection experiments is described. Most of the preliminary tests were carried out on seed lots of 200 gm. In the final experiments large seed lots were divided into portions of 15 kg., each of which was immersed in 50 l. of solution. Dusting was carried out in machines which were only half filled with seed. The degree of control of root rot was estimated by counting the percentage of diseased plants, and the total number per metre, allowance being made for those killed before emergence.

Immersion of the seed for ten minutes in water heated to 60° to 61° C. was injurious to germination and failed to give satisfactory control of root rot.

Somewhat better results both as regards germination and control of root rot, were given by 40 minutes' immersion in 25 per cent. hydrochloric acid or 2 to 60 minutes in concentrated sulphuric acid (1 kg. per 4 kg. seed), followed by neutralization in lime-water.

Germination was impaired by 18 to 24 hours' immersion in 2 per cent. copper sulphate in two out of three tests and the treatment did not give satisfactory control of root rot. Similar results were obtained with 0·1 per cent. corrosive sublimate (18 hours' immersion), while various other copper and mercury preparations were more or less ineffectual.

One to two hours' immersion in 0·25 per cent. agfa, and agfa dust applied at the rate of 10 to 20 gm. per kg. of seed, gave promising results, as was also the case with uspulun (two hours' immersion in a 0·5 per cent. solution); 1762 B (a phenol-mercury preparation from L. Meyer, Mainz, applied at the rate of 6 gm. per kg. of seed); and 225 (Saccharinfabrik, Magdeburg), a preparation containing 8 per cent. mercury cresol sodium cyanide (i. e., about half the amount of mercury present in germisan), applied at the rate of 10 gm. per kg.

Good control of root rot and a marked increase of germination were given by two hours' immersion in 0·25 per cent. germisan, and by steeping for one hour in 0·2 per cent. tillantin C or dusting with the same preparation at the rate of 7·5 to 10 gm. per kg. of seed. In the few serious cases of root rot occurring during the experiments, these disinfectants greatly minimized the losses.

LAUBERT (R.). **Die schädlichste Blattkrankheit der Treibgurken.** [The most injurious leaf disease of greenhouse Cucumbers.]—*Gartenwelt*, xxx, 34, pp. 537–538, 2 figs., 1926.

Leaf blotch of cucumbers (*Corynespora melonis*), first observed in England in 1896 and in Germany in 1909, is stated to be much the most serious leaf disease of greenhouse cucumbers in the latter country.

Dry, pale yellowish-brown or straw-coloured to dingy leaden-grey or brownish, angular or round spots, frequently surrounded by a dark border, are irregularly scattered over the leaves, the lower ones being attacked first. The desiccated centres of the spots often rupture. The densely packed, slender, dark grey conidiophores of the fungus, terminating in unusually large, pluriseptate spores, are sometimes visible to the naked eye between the thick, white hairs of the leaf. In hothouses infection spreads with alarming rapidity and the plants may be almost entirely destroyed. Outdoor cucumbers may also be attacked to a slighter extent. There are some indications of varietal susceptibility, Weigelt's Beste von Allen, for instance, being more resistant than Rockford's Telegraph. Melons and vegetable marrows are also susceptible.

The measures recommended for the control of leaf blotch include thorough disinfection of houses, frames, windows, and the like with some suitable preparation such as 2 per cent. copper sulphate or milk of lime; use of healthy soil; careful cultivation, avoiding excess of nitrogenous fertilizers; immersion of suspected seed in a solution of 2 per cent. copper sulphate, 0·5 per cent. formalin, or 0·25 per cent. uspulun; and regulation of the temperature (which should be kept below 30° C.) and humidity of the houses. Should these measures fail to prevent infection, repeated applications of 0·4 per cent. potassium sulphide, 1 per cent. Bordeaux mixture, or

sulphur dust will be necessary. In very severe cases the affected plants must be destroyed.

WOLF (F. A.) & LEHMAN (S. G.). **Diseases of Soy-beans which occur in North Carolina and the Orient.**—*Journ. Agric. Res.*, xxxiii, 4, pp. 391–396, 1926.

In this paper a brief account is given of the distribution and prevalence of the following diseases of soy-beans (*Soja max*) known to be common both to North Carolina and to eastern Asia (Japan and Manchuria).

Wilt (*Fusarium tracheiphilum*); mildew, caused by what was thought to be a hitherto undescribed fungus to which the name *Peronospora sojae* was given [*R.A.M.*, iii, p. 627] when first collected in North Carolina in 1923, but now recognized to be due to a species agreeing morphologically with *P. manshurica* (Naoum.) Gäumann, of which *P. sojae* should, therefore, be regarded as a synonym; brown spot (*Septoria glycines*); pod and stem blight (*Diaporthe sojae*); anthracnose (*Glomerella glycines*); leaf spot (*Cercospora diazu*); and bacterial blight (*Bacterium sojae*). All these diseases have been definitely proved to be seed borne, with the exception of wilt and leaf spot. Two other diseases, namely, bacterial pustule (*Pseudomonas phaseoli* var. *sojense*) and sclerotial blight (*Sclerotium rolfsii*), are found in North Carolina but have not yet been reported from eastern Asia. Soy-beans in Manchuria are subject to attack by a fungus which has been identified as *Sclerotinia libertiana* [*S. sclerotiorum*]. Although found on various crops in North Carolina, this fungus has not been reported to infect soy-beans. Other fungi found in Manchuria to be associated with soy-bean diseases include *Hypochnus centrifugus* [*Corticium centrifugum*], *Uromyces sojae*, and *Pleosphaerulina sojaecola* with its conidial stage *Phyllosticta sojaecola*.

WOLF (F. A.). **Brown spot disease of Soy-bean.**—*Journ. Agric. Res.*, xxxiii, 4, pp. 365–374, 9 figs., 1926.

In this paper, the author describes investigations started in 1922 following the appearance in North Carolina of a brown spot disease of soy-beans, the cause of which was determined as *Septoria glycines*, an organism recorded as producing a similar disease in Japan in 1915.

The disease causes the development of brown or reddish-brown, angular spots on the foliage and attacks also the stems and pods. The fact that infection shows itself first on the cotyledons, and causes defoliation from below upwards, spreading from the unifoliate to the trifoliate leaves, indicates that the fungus is probably carried on the seed.

The organism was readily isolated and developed olive-brown colonies in culture. Pycnidia formed in abundance on solid media. The conidia are hyaline, filiform, curved, indistinctly 1- to 3-septate, average length 35 to 40 μ, and breadth varying from 1·4 to 2·1 μ. The pycnidia in the leaves are globular to conico-globose and open mainly to the upper surface; those on the stems are flattened, owing to their position between the harder tissues. Their average size is from 90 to 100 μ in diameter (extremes 60 to 125 μ). In-

oculations into healthy plants gave positive results. Infection occurs through the stomata, and the mycelium in the tissues is intercellular. The conidia remain viable during the winter on decaying stems and leaves. Preliminary tests indicate that there is a considerable difference in susceptibility amongst the varieties of soy-beans grown experimentally.

LEHMAN (S. G.) & WOLF (F. A.). **Pythium root rot of Soy-bean.**—*Journ. Agric. Res.*, xxxiii, 4, pp. 375–380, 2 figs., 1926.

Soy-bean root rot was recorded for the first time in North Carolina in 1923 [*R.A.M.*, iv, p. 468]. Necrotic wet rot lesions affect the stems and roots near the ground level and result in the dying off of the plants.

A description is given of the mycelial characters and morphology of the conidia, oogonia, and antheridia of the causal organism, which is believed to be identical with *Pythium de Baryanum*. It was grown in culture and successful inoculations were carried out.

LEHMAN (S. G.) & WOLF (F. A.). **Soy-bean anthracnose.**—*Journ. Agric. Res.*, xxxiii, 4, pp. 381–390, 3 figs., 1926.

The cause of the anthracnose of soy-beans prevalent in North Carolina was at first thought to be *Glomerella cingulata*, but a comparative study of isolations and cultures from diseased plants has revealed certain morphological distinctions between the two fungi. The perithecia of the soy-bean organism are larger than those of the cause of apple bitter rot, measuring 220 to 340 μ in diameter, against 125 to 250 μ. The asci are also larger, being 70 to 106 by 9·5 to 13·5 μ, instead of 55 to 70 by 9 to 10 μ. The ascospores are hyaline, slightly curved, blunt-pointed, unicellular, and measure chiefly 18 to 28 by 4 to 6 μ, as against 9 to 18 by 4 to 5 μ in *G. cingulata*. The conidial acervuli are black, setae numerous, brown, 100 to 200 μ in length; conidia hyaline, curved, bluntly tapered, unicellular, 16 to 25 by 3·75 to 4·5 μ (average length 20 to 22 μ).

Inoculations showed that the fungus from decayed apples failed to produce infections on soy-beans, while the type of decay produced by the soy-bean fungus on apple fruits possessed none of the characteristics associated with bitter-rot.

The ascogenous stage has been found on diseased stems which overwintered in the field, and has been developed in culture. It is named *Glomerella glycines* n. sp., the imperfect stage being considered to be identical with Hori's *Colletotrichum glycines*.

Mycological work.—*Rept. Dept. of Agric. Barbados, 1925–1926*, p. 10, 1926.

The following reference of phytopathological interest is contained in this report. Roots of artichoke plants were severely attacked by *Sclerotium rolfsii*, which caused a distinct wilting. The removal of diseased plants and the application of lime to the soil are recommended, as well as careful attention to drainage, and wide spacing.

BERRO AGUILERA (J. M.). **Memoria de las experiencias e investigaciones realizadas en la Estación de Patología Vegetal de Almería durante el año 1925, sobre la Ceratitis capitata y otras enfermedades de las Uvas de Ohanes.** [Report of the experiments and investigations carried out at the Plant Pathology Station, Almeria, during the year 1925, on *Ceratitis capitata* and other diseases of the Ohanes Grape.]—Pamphlet of the *Estac. Pat. Veg., Almería*, 54 pp., 1926.

In the second part of this report the author deals with the causes of the fermentation of barrelled grapes, and distinguishes between those cases in which the grape cluster is infected by parasitic fungi before packing, and those in which the decomposition results from organisms that have developed in the bunches after the latter are picked and packed.

Of the diseases in the first category, white rot (*Coniothyrium diplodiella*), although not widespread in the province of Almeria, is not uncommon in damp situations. A description is given of the mode of infection by this fungus and its frequent transmission on the implements used for cutting the bunches. The difficulty of controlling this disease by fungicides [*R.A.M.*, iv, p. 141] is emphasized, and the sole means of preventing spread appears at present to be to discard all bunches that show definite signs of attack.

Guignardia [*Physalospora*] *baccae* [*R.A.M.*, i, p. 101] is of common occurrence. The pulp in infected berries does not actually change colour, but the skin becomes darkened. As the disease develops, the berries become covered with minute brown pustules; later on they soften and sometimes are slightly wrinkled, although never completely dried up. The whitish, much branched, intercellular mycelium is sometimes so abundant as to form a white layer. Two types of pycnospores have been observed, the first to appear being fusiform and the later ones curved. The disease can be controlled by spraying with copper fungicides to which it is recommended to add casein as an adhesive.

Exobasidium vitis is less frequent and only occurs under very damp conditions. The affected grapes are livid in colour and eventually sunken spots, in which light brown spore pustules develop, are formed.

To the second category belong a number of organisms which are briefly described. Of these, *Penicillium glaucum* is undoubtedly the most active, followed by *Botrytis cinerea* and *Sterigmatocystis nigra* [*Aspergillus niger*]. An *Alternaria*, probably a conidial form of *Pleospora*, is also fairly common, and can cause almost as much injury as *P. glaucum*. A fungus that is doubtfully referred to *Capnodium salicinum* was observed in several bunches, generally on the stalks, and was associated with honey-dew from the insect *Dactylopius vitis*. In this case infection must have been present before the bunches were picked. A *Cladosporium*, which is thought to be probably a form of *Exobasidium vitis*, was also found on some decomposing bunches. *Monilia candida* [*Candida vulgaris*], an organism which is stated to be very common in fermenting manure, was obtained from the pulp of decomposing grapes. *Mucor stolonifer*, *M. racemosus*, and *M. mucedo* were frequently encountered, though apparently absent from the bunches before packing. They

were isolated, however, from the chopped cork used for packing the bunches [*R.A.M.*, v, p. 713]. It is, therefore, strongly recommended to sterilize not only the cork but also any other packing material used in the barrels, either by heat or by treatment with chlorine or sulphurous vapours, since the use of contaminated packing material may have disastrous results, and it is probable that many of the fungi that damage the bunches are carried on the cork.

Various bacteria have also been found on the bunches, causing small spots on the stems and grapes, which spread and become dark yellow or ochre in colour, the stalk gradually drying up. The organisms concerned are thought to be quite distinct from *Bacillus uvae*.

A detailed account is given of the changes which the bunches undergo after packing, especially those which affect the stalks and lead to the loss of their green colour. The blackening of the stalks, which frequently develops and is accompanied by a loosening of the attachment of the individual grapes to the bunch, is often the result of the action of the various organisms mentioned above.

In the brief section on cold storage, it is stated that the best results appear to be obtained when the barrels are stored between 3·6° and 5° C. Below 10° it is stated that the bunches will keep for several months without undergoing decay, provided they are in perfect condition when packed.

KOTTE (W.). **Prüfung von Rebschädlingsmitteln im Jahre 1925.** [Testing of preparations for the control of Vine pests in the year 1925.]—*Weinbau u. Kellerwirtsch.*, v, pp. 39–42, 51–54, 1926. [Abs. in *Centralbl. für Bakt.*, Ab. 2, lxviii, 1–7, pp. 141–142, 1926.]

The following preparations, *inter alia*, were tested in 1925 for their efficacy in the control of *Peronospora* [*Plasmopara viticola*].

I. Sprays. Nosperit (Höchst Farbwerke) [*R.A.M.*, v, p. 533] rapidly forms a suspension, settles slowly, sprays easily, adheres satisfactorily, and does not burn the foliage. *Peronospora* preparations A and AB (Chem. Werke Weiler ter Meer) are readily soluble in water and adhere well, causing no injury to the leaves. H. II. 41 (Akt.-Gesellsch. für Anilinfabrikation) is a greyish-red, readily soluble preparation, with no tendency to settling, good adhesive properties, and harmless to the vines.

II. Dusts. Nosperit in dust form also proved satisfactory. Horst's copper dust produces slight scorching when used in large quantities. P.W. 166a (Bayer & Co.) was found to surpass all the other preparations in mechanical properties and caused no injury to the foliage.

Elosal-neu (Höchst Farbwerke) was found satisfactory for the control of *Oidium* [*Uncinula necator*] on a small scale, especially when used in combination with 1 per cent. Bordeaux mixture. Sulfurella sulphur (Chem. Fabrik, Andernach) and Disperser Schwefel S. I and S. II (T. Goldschmidt, Essen) were easy of application and non-injurious.

Of the preparations for the combined control of *P. viticola* and

the vine moth [*Clysia ambiguella*] tested in 1925, nosprasit (Höchst Farbwerke) was the most promising.

VENKATA RAO (M. K.). **Report of work done in the mycological section during 1924-25.**—*Ann. Rept. Agric. Dept.* [*Mysore*] *for the year 1924–25*, Part II, pp. 7–9, 1926.

During the year under review spraying work in connexion with the koleroga disease of areca palms [*Phytophthora arecae*: *R.A.M.*, v, p. 361] has been much extended. Nine hundred and fifty garden owners took up the treatment, with the result that in the infected area 5,503 acres were sprayed in 1924, as compared with 2,726 in 1923, while up till June in 1925 about 2,000 acres were treated. In 1924 the estimated total saving to the owners was Rs. 1,500,000 to 1,600,000 [over £112,000]. The use of casein in place of resin and soda as an adhesive in the Bordeaux mixture used in these operations has been even more widespread than in the previous year, about 1,800 acres of garden being thus treated, as compared with 200 in 1923–4. A new mixture, Martini's Bordeaux solution (potash alum added to weak Bordeaux mixture), was successfully tried on a small scale against the disease, its advantage being that the cost of chemicals required is Rs. 2 per acre less than in the case of ordinary Bordeaux.

Very satisfactory results have been obtained in the control by spraying of the black rot of coffee [*Corticium koleroga*]. It is estimated that an increase of Rs. 100 per acre was obtained from the sprayed plots as compared with the unsprayed areas, while the cost of treatment works out at only Rs. 9 to 11 per acre. Further proof of the efficacy of this treatment was shown by the vastly increased demands (beyond what could be met) for help in this direction. Altogether an area containing nearly 8,000 bushels was sprayed. Here again the resin soda mixture was replaced by the casein lime solution with satisfactory results.

Investigations on the treatment of smut [*Ustilago eleusinis*: *R.A.M.*, ii, p. 308] of ragi [*Eleusine coracana*] by various fungicides were unsuccessful, but it is stated that a clue has been obtained as to the effective control of the disease.

A mildew [? *Oidium* sp.] of betel vine [*Piper betle*] was successfully controlled in one garden by spraying.

MCDONALD (J.). **Report of the Mycologist.**—*Ann. Rept. Kenya Dept. of Agric. for the year ended 31st December, 1925*, pp. 141–148, 1926.

Further investigations have confirmed the view that coffee brown blight and coffee berry disease, both of frequent occurrence in Kenya Colony [*R.A.M.*, v, p. 298, and below, p. 92], are caused by different strains of *Colletotrichum coffeanum* [*Glomerella cingulata*]. The strain isolated from leaves and berries affected with brown blight gave negative results when inoculated into green berries, while positive results were obtained when cultures isolated from coffee attacked by berry disease were used. Spraying has effected a fairly satisfactory control of the latter disease; in one case the loss was reduced from 50 per cent. in the previous year to 8 per cent. in that under review.

An outbreak of sugar-cane mosaic, limited to the Nyanza Province, was reported [*R.A.M.*, v, p. 576].

The previous diagnosis of the pink mouldy condition of maize as being due to *Gibberella saubinetii* [*R.A.M.*, v, p. 292] has been confirmed by the discovery of the perithecial stage on dead maize stalks in two districts.

A disease of antirrhinums under investigation in Nairobi appears to be due to the same fungus as that isolated from diseased coffee seedlings in 1924 [? *Rhizoctonia solani*: *R.A.M.*, v, p. 17], and it has since been found causing a potato scab. Inoculations from these hosts failed to produce the disease in coffee seedlings, but the strain from coffee reproduced the antirrhinum disease. It appears that very favourable conditions are necessary before the fungus becomes aggressively parasitic.

Inoculation experiments with the *Cerebella* which causes a disease of native sorghum [*C. sorghi-vulgaris*: *R.A.M.*, iv, p. 271] have given positive results, but only when the heads were exuding a sugary secretion. This has only been observed during cold weather, but whether it is entirely due to climate remains uncertain. A similar fungus was found on *Cynodon dactylon* [see also below p. 91].

An epidemic of black stem rust of wheat (*Puccinia graminis*) caused severe loss on a few farms during the season.

Other fungous diseases noted or definitely identified for the first time included head smut of maize and sorghum (*Sorosporium reilianum*) [*R.A.M.*, v, p. 292], brown blight of tea (*Colletotrichum camelliae*) [*Glomerella cingulata*], sorghum rust (*Puccinia purpurea*), anthracnose of lucerne (*Colletotrichum trifolii*), leaf blight of beet (*Cercospora beticola*), *Isariopsis griseola* on leaves of beans, *Corynelia clavata* [*C. uberata*] on leaves of *Podocarpus gracilior*, and *Aecidium solani-unguiculati* on leaves of *Solanum* sp.

WALTERS (E. A.). **Report on the Agricultural Department St. Lucia [West Indies], 1925.**—33 pp., 1926.

In the section of this report dealing with plant diseases (pp. 12–14), an account is given of the progress of the campaign against the Panama disease of bananas [*Fusarium cubense*]. Since the introduction of the system of planting sections only after examination for freedom from disease [*R.A.M.*, v, p. 404], an evident reduction in infection has been observed. The importance of planting on uninfected land was shown in one case when several fields planted with the susceptible Gros Michel variety became badly infected, and it was found that formerly on this same plantation unproductive clumps of Gros Michel had been allowed to die out, probably owing to the Panama disease, and were not removed. On adjacent land, where bananas had not previously been grown, the Gros Michel plants from similar sections are free from disease and are fruiting satisfactorily.

Root disease of sugar-cane (*Marasmius sacchari*) was apparently encouraged by the partial exhaustion of the soil due to continuous ratooning. Ring spot of the leaves of sugar-cane (*Leptosphaeria sacchari*), usually accompanied by red spot of the leaf sheath (*Cercospora vaginae*), was conspicuous on old canes on one estate. Gumming disease (*Bacterium vascularum*) was found on two

sugar-cane estates at the end of the year. This disease causes stunting and dwarfing of the stools, with a serious reduction in tonnage per acre. Reaping early is recommended, and the replacing of susceptible varieties, such as Bourbon BA 6032, Sealy Seedling, B 11569, and B 147, by other varieties which have been found to be resistant, such as BH 10 (12) and D 116.

Pod rot of cacao (*Phytophthora*) [*faberi*] and *Diplodia* [*Botryodiplodia theobromae*] were rather prevalent in estates subject to high rainfall.

Bud rot of coco-nuts was observed on one estate, and directions were given to remove and burn the affected trees, nuts, and leaves, to improve draining and mulching, and to select carefully the seed nuts for use in the nursery. 'Little-leaf' disease [*R.A.M.*, iv, p. 467] was found also in the coco-nut plantations and was treated by burning.

Work connected with insect and fungus pests and their control. —*Rept. Agric. Dept. St. Vincent* [*West Indies*] *for the year 1925*, pp. 13–18, 1926.

This report contains *inter alia* the following references of phytopathological interest.

Sugar-cane was frequently attacked by root disease (*Marasmius sacchari*), and also by the rind fungus (*Melanconium sacchari*) and pineapple disease (*Thielaviopsis paradoxa*).

Phytophthora rot of cacao pods [*P. faberi*] was moderately common.

Elsewhere in this report it is stated that cotton plants in unweeded fields were killed by the attacks of *Sclerotium rolfsii*, the disease being probably aggravated by the abundance of weeds (especially *Cynodon dactylon*), which rendered the plants etiolated and spindly. Cases of soft rot of the cotton boll caused by *Phytophthora* sp. [*R.A.M.*, v, p. 215] were recorded, chiefly in the High Leeward part of the island. In numerous fields, 25 per cent. of the bolls were attacked and rendered useless, and an infection of 60 per cent. or more has at times been noted. This is attributed largely to the ideal conditions for the growth of the fungus while the bolls are maturing. Most of the Sea Island cotton is planted so that it matures its bolls in the wettest months of the year.

BENSAUDE (MATHILDE). **Diseases of economic plants in the Azores.**—*Kew Bull. Misc. Inform., 1926*, 9, pp. 381–389, 1 fig., 1926.

This is a list, arranged by hosts, of the most prevalent diseases of crop plants in the island of S. Miguel (Azores), together with brief notes on their incidence in September to December, 1923. Amongst several interesting records the following may be mentioned.

Typhula variabilis is considered by local observers to be the most destructive of the diseases of sugar beet in the island, and the author observed a root rot destroying some 30 per cent. of the roots in one field, associated with a fluffy white mycelium and small round sclerotia, about 1 mm. in diameter, which probably belonged to this fungus, though no perfect stage was observed.

A leaf mould of chilli pepper (*Capsicum annuum*), due to a species of *Cladosporium* identical with, or very closely resembling, *C. herbarum*, causes olivaceous, velvety patches up to 1·5 cm. in diameter on the lower surfaces. The affected leaves turn yellow and drop.

Potato blight (*Phytophthora infestans*) is very serious in the island. The attacks are, no doubt, favoured by the high atmospheric humidity and even, mild temperature maintained throughout the whole year.

Amongst fruit diseases, a leaf spot is caused on apples by a species of *Marssonina*, closely allied to *M. mali* as recorded by Miyake in Japan. The infected leaves become yellow, but show numerous green blotches of irregular shape, varying in diameter from 0·5 to over 1 cm. and each bearing one or more acervuli of the fungus. The spores are frequently sessile on the sub-cuticular stroma, and measure from 20 to 30 by 6 to 7 μ in diameter, whereas in the Japanese fungus conidiophores appear to be always formed, and the spores are only 14 to 20 by 4·5 to 6 μ. These differences in size, however, probably depend on climatic conditions, and a closer comparison of specimens and cultures from both countries is considered necessary before they can be separated as distinct species. In many of the acervuli on the infected leaves, when kept in a moist chamber, the immature spores budded off small, hyaline conidia, measuring approximately 5 by 2 to 3·5 μ. All attempts at germinating the spores failed.

A disease of the grape-cluster caused by *Physalospora baccae*, similar to that recorded by Nishikado in Japan [*R.A.M.*, i, p. 101], was very destructive in one instance observed. The pulp of infected berries becomes abnormally watery and the vascular tissues become brown. Berries which do not drop, gradually become wrinkled and mummified. The pycnidial stage of the fungus was alone observed, and was identical with *Macrophoma reniformis* as described by Viala and Ravaz. Both macroconidia (20 μ long) and microconidia (5 μ long) were found on the berries. A culture started from a single microconidium on grape juice agar produced, after twenty days, typical pycnidia with perfectly normal macroconidia.

Tea suffers from the algae causing red rust (*Cephaleuros mycoidea* and *C. parasitica*) and the leaves bear *Pestalozzia theae* and *Colletotrichum camelliae* [*Glomerella cingulata*], which do little damage.

Trabajos de las Estaciónes de Patología Vegetal. [Work of the Plant Pathology Stations.]—*Bol. Estac. Pat. Veg.*, i, 3, pp. 107–113, 1926.

In this paper a summary is given of recent work carried out at the various plant pathology stations in Spain, namely, those of Madrid, Barcelona, Almeria, and Valencia. The following points of interest are mentioned. In the Barcelona area, *Polystigma ochraceum* was found on almonds, *Phytophthora infestans* and *Verticillium albo-atrum* on potatoes, and *Rhizoctonia violacea* f. *medicaginis* [*R. crocorum*] on beans. Satisfactory results were obtained

by spraying olive trees with Bordeaux mixture (1 per cent., mixed with an adhesive) for the control of *Cycloconium oleaginum*.

In the Almeria area, 'knot' of the carob bean [*Ceratonia*], which is said to resemble olive knot (*Pseudomonas savastanoi*), has been under investigation. Attacks of *Phytophthora infestans* on potato and tomatoes developed as soon as the shoots appeared above ground, and spray applications were ineffective unless an adhesive was added to the mixtures.

ROSEN (H. R.). **Morphological notes together with some ultra-filtration experiments on the crown-gall pathogene, Bacterium tumefaciens.**—*Mycologia*, xviii, 5, pp. 193–205, 2 pl., 1926.

The writer, by means of a special staining technique, elaborated by himself, gives some interesting information concerning the morphology and life-history of the crown-gall organism (*Bacterium tumefaciens*). In the photomicrographs which accompany the paper the single flagellum of the bacterium is very clearly shown. From an examination of a large number of individual bacteria, he determined the size of the latter to be extremely variable, measurements from 0·6 to 3·6 μ in length, and 0·3 to 1·0 μ in width, being obtained. This would largely account for the lack of close agreement in the descriptions of other writers on this point. A process of budding, comparable to that found in the yeasts, is described and figured. Evidence is put forward to show that spores do not occur in this organism, and that they would not be expected to be present in view of its relationships and the absence of spores in any plant pathogen known to the writer. Certain deeply staining equatorial bodies are described and interpreted as suggesting some kind of primitive nuclear phenomenon. The presence of buds was further proved by filtration experiments, using a Berkefeld V filter. After passing a culture of *Bact. tumefaciens* through this filter, the filtrate was found to contain rods which on transferring to a nutrient solution gave rise to typical colonies of the crown-gall organism. Repeating this process with *Bacillus amylovorus*, a form which possesses smaller rods and no buds, the filtrate remained sterile. Finally a comparison is made between the bud-like processes described by Barnard [*R.A.M.*, iv, p. 687] as occurring in the virus of various animal tumours, and the buds of *Bact. tumefaciens*.

WISSEMANN. **Pilzkrankheiten des Brotgetreides.** [Fungous diseases of cereal crops.]—*Ber. Westpreuss. Bot.-zool. Ver.*, xlviii, pp. 63–67, 1926.

Notes are given on the infection of cereal crops in the Danzig Free State by the snow mould (*Fusarium nivale*) [*Calonectria graminicola*]; the rusts (especially *Puccinia graminis*); and ergot (*Claviceps purpurea*).

Control of the snow mould may be effected by the use of carefully selected seed, which should be sown sparsely and comparatively late, after treatment, if necessary, with uspulun, fusariol, or corrosive sublimate.

The life-history of black rust is briefly described. Legislation providing for the eradication of *Berberis* and *Mahonia* bushes in

the vicinity of grain fields is stated to be now in force in Germany and the Danzig Free State, but as the fungus is capable of overwintering in the mycelial and uredospore stage, except under extremely rigorous conditions, this is not likely to give complete control. Experiments in the capture of the uredospores of *P. graminis* in spore traps saturated with glycerine resulted in the collection of seven spores per sq. cm. in a week, corresponding to 175,000,000 over an area of 0·25 hect. Notes are given on various aspects of the cereal rust problem.

A short account is also given of the mode of infection of *C. purpurea*, with a note on the pharmaceutical properties of ergotin, sphacelin, and cornutin.

GABOTTO (L.). **Le ruggini dei cereali** [Cereal rusts.]—*Il Coltivatore*, lxxii, 30, pp. 373–375, 1926.

The statement is made that, judging from the reports received from all cereal-growing regions in Italy, the year 1926 was marked by heavy outbreaks of rusts (*Puccinia* spp.) all over the country, with damaging results to the crops, especially wheat. The observations are rather disconcerting in that all varieties, even those which were considered to be resistant, were severely attacked in one region or another, a fact which indicates the still unsatisfactory state of the knowledge of these diseases in Italy.

MAXWELL (IRIS). **Black rust in Scotland.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 138–145, 1 pl., 1926.

As a result of investigations undertaken in 1924 the statement is made that black rust of cereals, *Puccinia graminis*, occurs in Scotland in scattered areas, and no attacks on an epidemic scale have been so far recorded. Heavy infection of cereals and grasses was noted only in the immediate vicinity of affected barberry bushes (the aecidial host being widely distributed over the south of Scotland), and the available evidence indicates that the rust may spread to a distance of about one mile from such bushes during the summer, rapidly decreasing in intensity, however, even at a short distance. Observations and experiments in the field and laboratory show that the following five biologic forms of *P. graminis* occur in Scotland, namely, *tritici*, *secalis*, *avenae*, *agrostidis*, and *phlei-pratensis*. Infection experiments with the forms *secalis*, *avenae*, and *agrostidis* indicate that these forms have the same powers of infection (host range) as have been described in England and North America.

No evidence was found that in Scotland the fungus is carried over the winter by means of uredospores, and the author is of opinion that the eradication of barberry will almost certainly result in the disappearance of the rust.

BRUNCHANT. **La production du Blé en 1926.** [The production of Wheat in 1926.]—*Comptes rendus Acad. d'Agric. de France*, xii, 29, pp. 812–822, 1926.

This paper contains the following references of phytopathological interest. The meteorological conditions during the spring of 1926 were favourable to fungous diseases of wheat, especially to the

rusts [*Puccinia* spp.], which developed severely at the end of February on the Japhet, Trésor, Bon Fermier, Inversable, and Oscar Benoist varieties; Alliés, Paix, and others were more resistant, while Wilhelmine, Téverson, and V. 23 were almost immune [see also *R.A.M.*, iv, p. 728].

Oscar Benoist, Wilhelmine, and Paix sown before the 5th to 10th November were heavily attacked by root rot [*Ophiobolus graminis* and *Leptosphaeria herpotrichoides*], while the December and January sowings were practically immune. No appreciable effect was produced on the incidence of this disease by the application of sulphuric acid or nitrocuprine.

DOBSON (N.). **The toxicity of the spores of Tilletia tritici to animals.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 82–91, 1926.

After a brief review of the literature dealing with the toxicity of the spores of *Tilletia tritici* to animals, the author describes a series of experiments carried out by him at the Royal Botanic Garden and at the Royal (Dick) Veterinary College, Edinburgh, in which two dogs, eight rabbits, eight guinea-pigs, and four fowls (free from spores in the digestive tract at the beginning of the experiments) were fed for periods from 14 to 172 days with food highly contaminated with the spores of this fungus. During the whole time of the tests all the animals remained in perfectly good health (with the exception of one of the fowls, which died of roup), and they all gained weight. Post-mortem examination failed to show pathogenic alterations in any of the internal organs. In view of the lengthy period of the tests, and the large quantity of spores administered, the author concludes, in contradiction to some other workers [*R.A.M.*, v, p. 478], that only in the most exceptional cases can the spores of *T. tritici* be regarded as injurious to animals.

Several experiments were made to test the viability of the spores that had passed through the alimentary tract of the various test animals, but in no case could germination be induced.

MACKIE (W. W.) & BRIGGS (F. N.). **Effects of Wheat treated with copper carbonate upon the common house mouse (Mus musculus).**—*Phytopath.*, xvi, 9, pp. 629–632, 2 figs., 1926.

The results of a series of experiments [details of which are given] showed that copper carbonate, as applied to wheat seed-grain for the control of bunt [*Tilletia tritici* and *T. levis*], acts as a repellent but not as a poison to mice. Treated seed-grain (of which an adult mouse may consume about $\frac{1}{3}$ lb. per month) may safely be exposed to mice for indefinite periods, and this repellent action of the chemical is likely to save large quantities of valuable material under ordinary farm conditions.

WESTERMEIER (K.). **Die Wirkung verschiedener Beizmittel gegen Nachinfektion und Ansteckungsversuche.** [The effect of various disinfectants on reinfection and inoculation experiments.]—*Pflanzenbau*, iii, 7, pp. 109–112, 1926.

Experiments were carried out at Friedrichswert (Thuringia) in 1925 to test the efficacy of various fungicides against the reinfec-

tion and inoculation of wheat seed-grain by bunt spores [*Tilletia tritici* and *T. levis*].

In the first test, artificially infected seed-grain was treated as prescribed with agfa, fusariol, germisan, Hohenheimer Beize [urania], kalimat, tillantin, uspulun (liquid and dust), and porzol dust. The plants in the agfa-treated plot made the most rapid growth, but gaps were shown in the stand. All the preparations used, especially urania and kalimat, had a repellent effect on birds. Complete control was given by agfa, fusariol, germisan, urania, and kalimat, the average percentage of diseased plants in the untreated plots being 14·97.

In the second experiment the seed-grain was not infected till three days after treatment. The best results in this case were given by germisan, which reduced the incidence of diseased plants from 5·78 to 0·75 per cent. Porzol [*R.A.M.*, vi, p. 22] was even more effective in reducing the number of diseased plants, but the latter were individually so heavily attacked that the actual number of infected ears was higher than in those treated with germisan.

In the third test the seed-grain was infected immediately on drying after treatment. The best control was effected by agfa, fusariol, and kalimat, while tillantin and uspulun dust were also quite satisfactory.

Judging by these results as a whole, the choice of the most efficacious fungicide against bunt lies between fusariol and germisan, closely followed by agfa and kalimat.

The results of experiments [which are described] in the inoculation of healthy seed-grain with bunt spores showed that neither the size of the endosperm nor the state of nutrition of the embryo affects the incidence of infection. It was further ascertained that scratches on the seed coat promote rapid germination by facilitating the admission of moisture and thus enable the seedlings quickly to pass the critical stage for infection.

BODNÁR (J.) & TERÉNYI (A.). **Beizversuche mit Tillantin B und Tillantin C gegen Weizensteinbrand.** [Disinfection experiments with tillantin B and tillantin C against bunt of Wheat.] —*Pflanzenbau*, iii, 5, pp. 73–75, 1926.

At the request of the Hungarian representatives of Meister Lucius and Brüning, Höchst a. M., the writers carried out a series of experiments in 1924 and 1925 at the Institute of Plant Biochemistry, Budapest, for the control of bunt of wheat [*Tilletia tritici* and *T. levis*] with the dark greenish-grey, water-soluble, very fine powders, tillantin B and tillantin C [*R.A.M.*, v, p. 729]. The former is stated to contain as effective principle an entirely new copper compound, besides a small quantity of a very active arsenical substance. The latter, in its new form, contains a mercury compound in addition to the above-mentioned substances. Analyses showed that tillantin B contains 9·47 per cent. copper and tillantin C 3·77 per cent., the corresponding amounts of arsenic being 1·08 and 0·68 per cent. Tillantin C contains also 4·17 per cent. mercury. Both preparations are applied in solution at a strength of 0·2 per cent., the period of immersion being one hour.

The results of germination experiments on filter paper and in

soil showed that neither of the preparations adversely affected the germinability or vigour of the seed, even when applied at a strength of 0·4 per cent.

Laboratory tests showed that bunt spores are completely destroyed by both the tillantin preparations even at a strength of only 0·1 per cent. for a period of 20 to 30 minutes. On the other hand, spores treated with copper sulphate regained their germinability on rinsing with dilute hydrochloric acid [*R.A.M.*, ii, p. 554].

In field experiments on heavily infected wheat, tillantin B and C reduced the incidence of bunt from 19·04 to 0·28 and 0·24 per cent., respectively.

Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenschutzdienstes. Mittel für Saatgutbeizung. [List of disinfectants of the German Plant Protection Service. Preparations for the disinfection of cereal seed-grain.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 9, pp. 75–76, 1926.

This list (superseding all previous issues) comprises all the cereal seed disinfectants officially recommended by the German Plant Protection Service [*R.A.M.*, v, p. 113]. In addition to a number of comparatively well-known preparations which have frequently been mentioned in this *Review*, the following are named: Agfasaatbeize G2r (J. G. Farbenindustrie A.G., Höchst. a. M., and Leverkusen bei Köln a. Rh.), 0·25 per cent., 30 minutes' immersion, for the control of bunt of wheat [*Tilletia tritici* and *T. levis*] and the snow fungus [*Calonectria graminicola*]; and 0·25 per cent., one hour's immersion, against stripe disease of barley [*Helminthosporium gramineum*]. Betanal (L. Meyer, Mainz, Ingelheimstr. 5), 0·75 per cent., 30 minutes' immersion, against *C. graminicola*. Tillantin Nassbeize (J. G. Farbenindustrie), 0·25 per cent., 30 minutes' immersion, against bunt; 0·25 per cent., one hour's immersion, or 0·5 per cent., sprinkling, against *C. graminicola*; and 0·25 per cent., one hour's immersion, for the control of stripe disease.

No definite conclusion as to the general efficacy of dusting has yet been reached, but the following (in addition to others already mentioned) gave good results in the current year's tests. Agfatrockenbeize (Tr. 334), manufactured by the J. G. Farbenindustrie, 175 gm. per cwt., against bunt and *C. graminicola*. Porzol H (Chinoin, Fabrik Chem.-techn. Produkte, Ujpest bei Budapest), 150 gm. per cwt., against bunt [*R.A.M.*, v, p. 172; vi, p. 22]. Trockenbeize 998 (Saccharinfabrik, Magdeburg) and uspuluntrockenbeize (Farbenindustrie), both at 150 gm. per cwt., against *C. graminicola*.

According to the plant protection officials at Landsberg a. d. W., the efficacy of the following preparations, which also gave good results in the above-mentioned tests, is impaired by certain deleterious secondary effects. Segetan-trockenbeize (Deutsche Gesellsch. für Schädlingsbekämpfung, Frankfurt a. M.), 150 gm. per cwt., against bunt. Tutan (Saccharinfabrik, Magdeburg), 100 gm. per. cwt. against bunt and 150 gm. per cwt. against *C. graminicola*. Trockenbeize 998, 150 gm. per cwt., against stripe disease. The two first-named preparations are stated to cause great inconvenience

to workmen by the dispersion of minute particles of the dust, and all three adversely affect the drilling capacity of the grain.

ERHARD-FREDERIKSEN (V.). **Foldudbytte og Fodsyge.** [Amount of yield and foot rot.]—*Ugeskr. for Landmænd,* lxxi, 36, pp. 561–563, 1926.

Foot rot of cereals in Denmark is attributed to the attacks of *Calonectria graminicola, Leptosphaeria herpotrichoides, Ophiobolus graminis,* and *Fusarium culmorum* [a brief account of each of which is given]. Control measures recommended include artificial drying of the seed-grain after wet seasons; careful selection of healthy seed-grain; disinfection with mercurial preparations, e.g. germisan or tillantin C; ploughing under of the stubble immediately after harvest; liberal applications of phosphatic fertilizers instead of stable manure for the wheat crop; rotation of crops; and thin sowing in widely spaced rows at a fairly late date.

ERHARD-FREDERIKSEN (V.). **Bekæmpelse af Fodsyge.** [Control of foot rot.]—*Ugeskr. for Landmænd,* lxxi, 40, pp. 628–629, 1926.

In a further discussion on the foot rot of cereals [see preceding abstract], the writer briefly touches on various possibilities of direct and indirect control, including treatment with sulphuric acid as practised in France [*R.A.M.*, v, p. 416, and below], applications of calcium cyanamide as recommended in Germany, and spraying with sodium chlorate.

GRAM (E.). **Bekæmpelse af Fodsyge.** [Control of foot rot.]—*Ugeskr. for Landmænd,* lxxi, 42, p. 667, 1926.

In this paper and in a previous number (36, p. 561) of *Ugeskr. for Landmænd,* the writer discusses the present position with regard to the control of foot rot in Denmark [see preceding abstracts]. Investigations and experiments in connexion with this disease have been resumed since 1925 at the Phytopathological Station, but it is as yet too early to issue official recommendations for control along any of the lines suggested by Erhard-Frederiksen.

RABATÉ (E.). **The use of sulphuric acid against weeds and certain crop parasites.**—*Intern. Rev. Sci. and Pract. of Agric.,* N.S., iv, 3, pp. 535–545, 2 pl., 1926.

The author describes the results obtained in France from the use of sulphuric acid for the eradication of weeds, and discusses also, the value of this treatment in the control of certain diseases such as foot rot of cereals (*Ophiobolus graminis* and *Leptosphaeria herpotrichoides*). The first trials on cereal fields are stated to date back to 1898, and at present several thousands of trucks of the acid are used annually, while some twenty manufacturers make special spraying machines for its application.

The marked efficiency of sulphuric acid in the control of foot rot has been established by tests in Gascony, Brittany, and Beauce [*R.A.M.*, iv, pp. 346, 409; v, p. 416]. The dilute acid is applied at the rate of 1,000 to 1,200 litres per hectare, the strength recommended for winter cereals being 10 per cent. of acid at 65° Baumé.

For oats and spring barley 4 to 4·5 per cent. is sufficient. The treatment is best given when winter cereals have five or six leaves, the applications being graduated from 15th December to 15th March in the south-west of France, while in the centre from 1st to 15th April is preferred. For oats and spring barley the plants should have two or three leaves at the time of treatment, generally the second half of April. By using a densimeter or Baumé hydrometer the strength of the crude acid is immaterial, provided the dilute solutions are at 13° Baumé for the winter cereals or 6° Baumé for the spring. The strong acid must always be diluted by pouring slowly into a large volume of water, to avoid splashing. The hands should be greased or protected by leather or rubber gloves, the eyes may be protected by goggles, and old clothes (woollen are best) and sabots should be worn during spraying. Simple, strongly constructed apparatus have been manufactured which facilitate the spraying of 800 to 1,500 litres or more of solution per hect. in a single transit. With an apparatus on wheels it is possible to treat a hectare in two hours at a total cost of less than fr. 100 (labour included). The machines must be of wood, rubber, lead, or special bronzes, in order to stand the acid.

RIEHM (E.). **Der Schneeschimmel.** [The snow fungus.]—*Biol. Reichsanst. für Land- u. Forstwirtsch., Flugbl.* 80, 4 pp., 1 fig., 1925. [Received November, 1926.]

A brief, popular account is given of the symptoms, life-history, and mode of infection of the snow mould of rye, which is stated to be chiefly due to *Fusarium nivale* [*Calonectria graminicola*], though other species of *Fusarium* may also be implicated. The following preparations are recommended for the control of the disease. Agfa-saatbeize or Agfa-saatbeize G2r, 0·25 per cent., 30 minutes' immersion. Sprinkling with 0·25 per cent. germisan. Roggenfusariol as directed. Segetan-neu, 0·1 per cent., 10 minutes' immersion. Urania-saatbeize, 0·25 per cent., one hour's immersion, followed by three hours' covering of the treated seed-grain with sacks. Sprinkling with 0·25 per cent. uspulun. Nassbeize tillantin, 0·25 per cent., one hour's immersion. A.Z. III (125, or 175), 0·25 per cent. [*R.A.M.*, v, p. 479], 30 minutes' immersion.

RIEHM (E.). **Beizgeräte.** [Steeping apparatus.]—*Biol. Reichsanst. für Land- u. Forstwirtsch., Flugbl.* 82, 4 pp., 3 figs., 1926.

The construction and use of the following appliances for the steeping of cereal seed-grain are described under three headings, namely, liquid treatment, hot water, and dusting. A. Liquid. (1) Apparatus supplied by the Halle Phytopathological Experiment Station (Güldenpfening, Stassfurt), estimated to treat 1·25 cwt. per hour [*R.A.M.*, iv, p. 661]. (2) Perfekt, (R. Kayser, Stettin), treating 2·5 cwt. per hour. (3) Degesch [ibid., v, p. 156]. (4) Wachtel (Maschinenfabrik Wachtel, Breslau 23, Ysselsteinstr. 4. (5) Jäger-Dix [ibid., iv, p. 624], made in three sizes to hold 70, 20, or 15 cwt., calculated to treat 230 cwt. in ten hours. Appliances intended for sprinkling are (6) Feller's steeping apparatus (J. Jörs, Görlitz) [*R.A.M.*, iv, p. 623], (7) Hohenheim (Maschinenbau Her-

renberg A.G., Stuttgart, Immenhoferstr. 18), both treating 8 cwt. per hour, and (8) Ideal [ibid., iv, 213, 623].

B. Hot water. (1) Appel-Gassner, (2) Büttner [ibid., iv, p. 624], both treating 4 cwt. per hour, (3) Jäger-Dix, and (4) Degesch.

C. Dusts, (1) Beizsack Halle (5 cwt. per hour); (2) Ideal No. 1 (6 cwt. per hour); Primus A and B (10 and 5 cwt. per hour, respectively); Lothrä (8 cwt. per hour) [ibid., v, pp. 479, 480]; and Puk (P. Lübke, Breslau 13, Kaiser Wilhelmstr.), estimated to treat 6 cwt. per hour.

ESMARCH (F). **Warum muss der Saatroggen heuer gebeizt werden?** [Why must seed Rye be disinfected this year?]—*Die Kranke Pflanze*, iii, 9, pp. 170–173, 1 fig., 1926.

A brief, popular description is given of the life-history and mode of infection of the snow-fungus (*Calonectria graminicola*), which is stated to have caused severe damage (up to 60 per cent.) to the current season's rye crop in Saxony. Consequently the disinfection of all rye seed-grain intended for autumn sowing is absolutely essential. The preparations recommended for this purpose are roggenfusariol, uspulun (0·25 per cent.), tillantin (0·5 per cent.), germisan (0·25 per cent.), agfa (0·25 per cent.), betanal (0·75 per cent.), segetan-neu (0·1 per cent.), and urania, all of which (with the exception of the last-named) may be applied by sprinkling at the rate of 7 to 8 l. per cwt. of seed-grain.

Satisfactory results were also given in the current season by dusting with höchst, tutan, and abavit, 67 to 78·5 per cent. of the treated plants surviving the winter compared with only 34 per cent. of the untreated [*R.A.M.*, v, p. 419; vi, pp. 12, 26].

JEHLE (R. A.), OLDENBERG (F. W.), & TEMPLE (C. E.). **Results of five years' selection for freedom from internal cob-discoloration in Corn.**—Abs. in *Phytopath.*, xvi, 9, p. 639, 1926.

In connexion with the series of tests to determine the relation of the pink, grey, brown, and other discolorations of the vascular and surrounding tissues of the interior of maize cobs to the yield and to the root, ear, and stalk rot diseases [associated with *Diplodia zeae*, *Gibberella saubinetii*, *G. moniliformis*, and *Cephalosporium acremonium*: *R.A.M.*, v, p. 543], the following points are of interest. In 116 tests with field maize the average yield from cobs with little or no discoloration was 60·11 bushels shelled maize per acre, compared with 51·75 bushels from badly discoloured cobs, a difference of 16·56 per cent. On poorer maize land the increased yield from healthy compared with diseased cobs was 9·15 bushels or 19·26 per cent., whereas on the best land the corresponding figures were only 4·75 bushels or 6·1 per cent.

VALLEAU (W. D.), KARRAKER (P. E.), & JOHNSON (E. M.). **Corn root rot—a soil-borne disease.**—*Journ. Agric. Res.*, xxxiii, 5, pp. 453–476, 10 figs., 1926.

A detailed account is given of the authors' experiments conducted in 1924 and 1925 with a view to differentiating between the

types of injury caused by the commonly accepted maize root rot organisms in America [*R.A.M.*, iv, p. 732, and last abstract]. Maize seedlings either freed or not from seed-borne organisms [ibid., v, p. 605] were grown in pots or jars containing (1) virgin soil untreated; (2) virgin soil steamed at 20 lb. pressure for one hour; (3) untreated soil from a plot on which maize had been continuously cultivated for some twelve years; (4) same soil to which a mineral fertilizer was added; (5) same soil steamed; (6) same soil treated with formaldehyde; (7) and same soil steamed and fertilized. Cultures were also made in pure sand and in sand to which different amounts of soil were added.

The results indicated that a severe rotting of the roots could be produced in the pots with soil from the continuous maize plot in the seedlings freed from seed-borne organisms. So, also, the addition of rotted roots from the field to the sand cultures of fungus-free maize seedlings resulted in a severe root rot, which was observed to progress more rapidly in pure sand, where there was a free movement of water, than in sand with an admixture of soil. The disease did not act as a seedling blight in the pot cultures, unless the causal organism had been previously activated by incubation of the rotted roots with a nutrient solution. Seedling blight was caused both by *Gibberella saubinetii* and *Fusarium succisae* (the latter isolated from a tobacco root), but in the cases when the the plants recovered from the initial injury, they apparently made as rapid growth as the controls. The authors failed in numerous cases to isolate either of these organisms from the naturally rotting maize roots in their experiments. *Diplodia zeae* was not found throughout the whole of their isolation studies, while *Fusarium moniliforme* [*Gibberella moniliformis*] and species of the *elegans* section of this genus were of common occurrence, but only caused occasional or slight injury, and are therefore believed to be but secondary invading organisms.

Microscopical examination of sections of rotting maize roots grown in infected soil and sand consistently showed the presence of a fungus with large, usually non-septate hyphae, and numerous oospores of the *Pythium* type, measuring from 18·8 to 27 μ (average 23·2 μ) in diameter. As these structures and the type of injury associated with their presence are very similar to those found in Lahaina sugar-cane grown in 'sick' soil and described by Carpenter as caused by a *Pythium*-like fungus [*R.A.M.*, iii, p. 484], the suggestion is made that maize root rot (as distinct from seedling blights caused by seed-borne organisms) is caused by a fungus similar to the sugar-cane root rot organism.

In the present experiments it was also found that rotten maize roots added to sand cultures of tobacco are capable of producing a type of injury apparently identical with the so-called brown root rot of tobacco in the field [*R.A.M.*, vi, p. 13]. The roots of maize seedlings grown in infected soil or sand developed, besides the rot, a lemon-yellow discoloration, under which the roots were found to be penetrated by a fungus similar to the mycorrhizal fungus described by Jones [*R.A.M.*, iv, p. 301]. This organism and the maize root rot fungus are both killed by heating the soil at 65° C. for 15 minutes.

AJREKAR (S. L.). **Observations on a disease of Jowar (Sorghum vulgare) caused by Sphacelia (conidial stage of Claviceps).**—*Journ. Ind. Bot. Soc.*, v, 2, pp. 55–61, 1 pl., 1926.

The writer describes a disease of jowar (sorghum) due to a species of *Sphacelia*, presumed to be the conidial stage of a *Claviceps*. The only parts of the plant affected are the ears, and these are characterized by drops of a sugary fluid being secreted on the apices of the flowers—hence the native names of the disease, 'chikatya' and 'sakharya', which mean sticky and sugary, respectively. Dissection of an affected flower shows that the ovary is completely filled with a mass of fungus tissue which eventually gives rise to a whitish or dark green, elongated stroma, in form recalling that of the ordinary ergot of rye (*Claviceps purpurea*). Spores produced on the surface of the convolutions of all the stromata agreed with those of the genus *Sphacelia*, while, in addition, dark stromata were found to bear on their surface the spores of a species of *Cerebella*, and yeast-cells were present in abundance in the greyish-white ones. Further development of the ergot sclerotia seemed to be inhibited by the *Cerebella* or the yeast.

The *Cerebella* is stated to grow as an epiphyte or parasite on the *Sphacelia* stromata. It has been identified as *C. sorghi-vulgaris*. Preliminary inoculation experiments indicate that infection with the *Sphacelia* occurs soon after the flowers open and before fertilization.

The disease has been found in the black soil tracts only, in the Deccan and Karnatic [Bombay], and appears in November and December. Moisture and a temperature of from 70° to 89° F. seem to favour it. Late sowing, therefore, tends to increase the incidence of the disease, which has not, so far, caused any appreciable damage to the crop. No information has been obtained which would suggest that ergotism of man or cattle is caused by this fungus.

A similar disease has been observed by the author on *Andropogon caricosus* var. *molicomous*, *Pennisetum alopecuros*, and *Ischaemum pilosum*, but the species of *Sphacelia* concerned appear to be distinct in the first and last-named of these grasses. True ergot bodies, uninfected by *Cerebella*, were seen in *P. alopecuros* only.

CARNE (W. M.). **Citrus pit (Pseudomonas citriputeale C. O. Smith).**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iii, 3, pp. 378–381, 3 pl., 1926.

The occurrence of citrus pit (*Pseudomonas citriputeale*) in South Australia has already been reported [*R.A.M.*, v, p. 487], but this is said to be the first record of the disease in Western Australia. It is stated to occur most frequently on lemons, and to a lesser extent on oranges and mandarins, though in California the reverse appears to be the case. So far twig infection has not been observed.

On leaves the infection is marked by the appearance of a blackened area usually on the side or tip, but occasionally central. The affected areas tend to dry and crack, and the leaves fall readily. On lemon fruits the spots are depressed, dry, circular or oval, reddish-brown, brown, or black, and up to three-quarters of an inch

in diameter. On oranges the spots are usually reddish-brown, and are smaller than on lemons. They may converge, forming irregular, dry, brown areas. As the spots are confined to the rind of the fruit, the disease is not considered of importance, unless climatic conditions favour the development of secondary rotting organisms. Infection has readily been obtained when the tissues were broken by pricking or otherwise injured. The fact that attempts to infect sound fruit have failed confirms the results previously obtained in America in showing that the bacterium is essentially a wound parasite. The April or May spraying with Bordeaux (4–4–50) or Burgundy (4–6–50) mixtures recommended for the control of brown rot [*Phytophthora hibernalis*: *R.A.M.*, v, pp. 89, 295] should be effective also against this disease.

POWELL (H. C.). **The control of blue and green molds of Oranges. Negative results from borax.**—*South African Fruit Grower*, ix, 13, p. 232, 1926.

Considerable success is stated to have been obtained in California with sodium borate or borax used as a surface coating on citrus fruits with a view to checking blue mould (*Penicillium italicum*) and green mould (*P. digitatum*) [*R.A.M.*, iv, p. 477]. Similar experiments carried out in the Transvaal, however, have failed to give satisfactory control under the local conditions, and the method is not, at present, recommended for use by citrus growers in South Africa.

A brief summary is given of the present status of decay control by borax in California. The Brogdex Company holds U.S. Patent No. 1,529,461: March 10, 1925, for the use of borax in the treatment of citrus fruits, and legal action is being taken to test whether this covers the methods commercially employed in other parts of the country.

BENLLOCH (M.) & DEL CAÑIZO (J.). **La lucha contra las plagas del Naranjo en España.** [Control of diseases and pests of the Orange in Spain.]—*Bol. Estac. Pat. Veg.*, i, 3, pp. 94–98, 1926.

In connexion with the National Conference of Orange Growers in Spain, arranged for October, 1926, certain observations are presented in this paper on the principal diseases and pests of the orange prevalent in the country, and control measures are considered, especially in their bearing on the preparation of the fruit for the export market. Fungous diseases appear to be of less importance in Spain than insect pests. The most generally known is the 'negrilla' (*Limacinia penzigi*) [*L. citri*: *R.A.M.*, iii, p. 211]. Damage is also frequently caused by gummosis, mal secco, foot rot, and root rot [ibid., iii, p. 523], as well as by certain non-parasitic diseases, such as chlorosis.

MCDONALD (J.). **A preliminary account of a disease of green Coffee berries in Kenya Colony.**—*Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 145–154, 1926.

A description is given of the symptoms caused by the destructive disease of green berries of coffee which was first recorded in Kenya in 1922 and reference to which was made in previous reports of the

author [*R.A.M.*, v, pp. 17, 298, and above, p. 78]. The disease is confined almost entirely to the berries, berry stalks, and a small area of the twigs immediately adjacent to the base of the latter. The branches are not killed by the attack, and the leaves remain perfectly healthy in appearance. In the field, the pulp of the diseased berries is often covered with numerous minute, black acervuli, morphologically indistinguishable from those of *Colletotrichum coffeanum* [*R.A.M.*, vi, p. 57]; the fungus isolated from such berries, and proved to be pathogenic in artificial inoculation experiments, differs, however, from other strains of *Colletotrichum* from coffee in some cultural characters [details of which are given] and in that, so far, it has failed to produce a mature perithecial stage on any of the media tested, while the other forms gave perithecia agreeing closely with *Glomerella cingulata*. The author prefers to regard it, for the present, as merely a strain of *C. coffeanum*, and states that there are indications that the various forms of *Colletotrichum* on coffee constitute a single polymorphic species.

In discussing methods of control, it is stated that experiments are in progress to test the value of certain manures in increasing the resistance of the coffee bushes to the disease. Seed selection work is also being carried out, as some types of bush have shown a considerable degree of immunity.

PETCH (T.). **Studies in entomogenous fungi. IX. Aegerita.**— *Trans. Brit. Mycol. Soc.*, xi, 1–2, pp. 50–66, 1 pl., 1 fig., 1926.

After an historical account of *Aegerita webberi*, the author gives brief descriptions of three forms of the fungus studied by him, namely: a form from Florida on *Aleyrodes citri*, a form from Ceylon on *Aleyrodes* and *Aspidiotus* spp.; and one from New Zealand on an undetermined scale on *Melicytus ramiflorus*. In the Florida form, the stromata are parenchymatous only in a single external layer of cells; stout hyphae spread separately from the stromata over the leaf, uniting into a continuous film where the sporodochia are formed. In the Ceylon form, the stromata are parenchymatous for half their thickness, and the hyphae spreading from them unite from the first into a hyaline film which surrounds them and covers the under surface of the leaf. Sporodochia are scattered over this film. In the New Zealand form, the stromata are parenchymatous down to their base, and a stouter byssoid film of hyphae is produced, consisting of a hyaline, continuous layer overlaid by a network of stout, pale brown hyphae. In the Florida form, the scale persists beneath the stroma, but in both the other forms no trace of the insect remains when the stroma is fully developed. While the characters of the stromata would indicate that the three forms are different species, the sporodochia [a description of which is given] in all are identical, and therefore they must all be referred to *Aegerita webberi*.

Attempts to obtain pure cultures from the sporodochia or stromata of all the three forms gave negative results, except in one doubtful case. This throws considerable doubt on the validity of the accepted method of distributing this fungus for the control of

Aleyrodes. The claim that successful propagation is obtained by grinding up in water leaves which bear the fungus, and spraying infected trees with this mixture, is disproved by the experience of all the investigators who have tried to cultivate the organism.

The resemblance between the sporodochia of *A. webberi* and conidial forms of a fungus also parasitizing scale insects in Formosa (briefly described and believed by the author to be a conidial form of a *Septobasidium*) suggests the possibility, slight as it may be, that *A. webberi* is a form of *Septobasidium*. No links, however, have been found between the former and any species of the latter that occur in Ceylon.

The paper terminates by a brief description of *Sirosphaera chlorostoma* [*R.A.M.*, iii, p. 212] which parasitizes the stroma of *A. webberi* in Ceylon and Florida, and of another fungus also collected from a specimen of *A. webberi* at Hakgala [Ceylon] which appears to be a *Tuberculariа* and is named *T. epimyces*.

KATÔ (Y.). **Note sommaire sur les trichophyties dans les provinces de Kiushiu et dans les îles de Liukiu et sur deux espèces nouvelles de Dermatophytes: Trichophyton coccineum et Bodinia spadix n. spp.** [Short note on trichophytosis in the provinces of Kiushiu and in the Liukiu islands, and on two new species of Dermatophytes: *Trichophyton coccineum* and *Bodinia spadix* n. spp.]—*Japan. Journ. Dermat. & Urol.*, xxvi, 4, pp. 306–358, 21 figs., 1926. [In Japanese with French summary. Abs. in *Trop. Dis. Bull.*, xxiii, 11, pp. 849–850, 1926.]

The two new species of Dermatophytes described in the present note are *Trichophyton coccineum* obtained from 5 cases of superficial tinea, 3 of herpes circinata, 1 of dysidrosis, and 1 of onchomycosis; and *Bodinia spadix* from a case of infantile superficial ringworm. *T. coccineum* is a true endothrix form; in the hairs it forms long chains of spherical, ellipsoidal, or cubical spores, 4 to 7 μ broad, while in nails it sometimes forms fine hyphae, 3 to 4 μ broad, and sometimes chains of relatively short cells, 5 to 6 μ in diameter. In cultures, the aspect of which is very characteristic, the mycelium is fine, and racket-shaped hyphae are common. Aleuriospores are borne on simple or branched hyphae, and chlamydospores, remarkable for their large size and irregular shape, occur terminally on lateral hyphae or in chains. Inoculations were positive on the hairy skin of a child, and also in the case of guinea-pigs, rabbits, and dogs, but with these animals the organism behaved as a pure ectothrix. *B. spadix* produced a clinical aspect resembling that caused by *B. violacea*. In culture on glucose agar it formed a fine, sparsely septate mycelium, about 3 μ in diameter, with racket-shaped hyphae, mycelial spores, and terminal intercalary chlamydospores. Inoculation was positive with guinea-pigs, rabbits, dogs, and cats, the latter being the most susceptible.

The other species found in this investigation comprised *Bodinia violacea* [*Trichophyton violaceum*], *B. glabra* [*T. glabrum*], *Grubyella ferruginea*, *Trichophyton pedis*, *Sabouraudites* [*Trichophy-*

ton] *asteroides*, *S. interdigitalis* [*T. interdigitale*], *S. ruber*, and *Epidermophyton cruris*.

A bibliography of 55 titles is appended.

TEMPLETON (H. J.). **A study of dandruff and of the Pityrosporon of Malassez.**—*Arch. of Dermatology*, xiv, 3, pp. 270–279, 4 figs., 1926.

Pityrosporon malassezi [*P. ovale*: *R.A.M.*, iv, p. 606] was found to be almost constantly associated (in 96 per cent. of the cases examined) with the condition of the scalp known as pityriasis simplex capitis, and it was also present in 85 per cent. of the cases of apparently oily dandruff (pityriasis steatoides), for which the writer proposes a different classification from that formulated by Sabouraud. The fungus was further found on 69 per cent. of the supposedly normal scalps inspected as controls, suggesting that incipient infection is probably present in a large number of individuals showing no pathological symptoms.

Slight growth of *P. ovale* was obtained under anaerobic conditions on a medium composed of 1·5 per cent. agar and 2 per cent. glucose in beerwort with a P_H value of 6·7.

GRIGORAKI (L.), FAYET, & MAGROU (J.). **Sur un nouveau dermatophyte du genre Aleurisma.** [On a new dermatophyte of the genus *Aleurisma*.]—*Comptes rendus Soc. de Biol.*, xcv, 27, pp. 649–651, 1926.

From an erythemato-squamous sore on a dog's head the writers isolated a species of *Aleurisma* [the cultural characters of which on various media are briefly described], with hyphae 2 to 4·5 μ in width and round or oval spores measuring 3·5 by 2·3 μ. Germination occurred in two to six days by means of one to three germ-tubes. The fungus is regarded as a new species, to which the name *A. vuillemini* has been given. Only one nucleus in each cell was observed [*R.A.M.*, iv, p. 736]. *A. vuillemini* produces lesions similar to those caused by *Microsporon canosum*, showing that the nature of the parasite in such cases cannot be predicted from the symptoms caused.

DOHI (K.), TAKAHASHI (S.), & SUZUKI (S.). **Ueber den vierten Fall von Mycetoma pedis in Japan.** [The fourth case of mycetoma pedis in Japan.]—*Japan. Journ. Dermat. & Urol.*, xxv, 10, pp. 803–827, 9 figs., 1925. [In Japanese. Abs. in *Trop. Dis. Bull.*, xxiii, 11, pp. 850–851, 1926.]

A description is given of the clinical symptoms caused by mycetoma pedis in a peasant from the neighbourhood of Tokio, and also of the cultural characters of the causal organism, which is stated closely to resemble *Nocardia bovis* [*Actinomyces bovis*].

LAPHAM (MARY E.). **Aspergillosis of the lungs and its association with tuberculosis.**—*Journ. Amer. Med. Assoc.*, lxxxvii, 13, pp. 1031–1033, 1926.

Details are given of a number of cases of pleurisy, bronchitis, pneumonia, emphysema, asthma, and other respiratory disturbances attributed to infection by *Aspergillus fumigatus* [*R.A.M.*, v,

p. 428]. Inoculation experiments on rabbits with pure cultures of this organism produced the typical symptoms of miliary tuberculosis. The writer urges the necessity for a systematic study of the frequency of aspergillosis both as a primary and secondary disease, and of its importance as a predisposing factor to tuberculosis in human beings and cows. The occurrence of ten cases of aspergillosis in three years in a remote village on the Blue Ridge Mountains (North Carolina) suggests that much might be learnt by the routine examination of the sputum in every case of tuberculosis.

HOPKIRK (C. S. M.). **Pneumomycosis in white swan.**—*New Zealand Journ. of Agric.*, xxxiii, 3, p. 192, 1926.

Examination at the Wallaceville veterinary laboratory (New Zealand) of the mould found in mycelial plaques on the walls of the air-sacs in the lungs of a white swan, which had succumbed to the attacks of a pneumomycosis, showed conidiophores and conidia typical of *Aspergillus fumigatus*. Each plaque had a diameter of from 1 to 3 cm. and was white round the edges but darkened and tinged with green towards the centre. This is stated to be the first case of the kind noted in New Zealand.

PELS (I. R.), DRESEL (IRMGAARD), & SALINGER (R.). **An unusual eruption due to an organism of the Monilia group. A preliminary report.**—*Arch. of Dermatology*, xiv, 3, pp. 280–293, 6 figs., 1926.

Report is made of an unusual chronic eruption of fungal origin, involving the face, ears, scalp, neck, upper chest, one thumb, and mouth of a seven-year-old boy.

Laboratory examination revealed the presence of an organism closely resembling *Monilia* [*Candida*] *albicans* in all the infected areas. The fungus was agglutinated by the patient's serum, but not by that of a normal child. The inoculation of guinea-pigs was only partially successful.

SIMMONS (J. S.). **A culture medium for differentiating organisms of typhoid-colon aerogenes groups and for isolation of certain fungi.**—*Journ. Infect. Dis.*, xxxix, 3, pp. 209–214, 2 col. pl., 1926.

The writer has obtained excellent results in differentiating between bacteria of the *colon-aerogenes* groups and certain fungi on Koser's citrate solution (*Journ. of Bact.*, ix, p. 59, 1924) with the addition of agar and brom-thymol blue (1·5 per cent. alcoholic). The composition of the medium is indicated. A number of fungi made luxuriant growth and produced striking colour changes on this medium, including eight strains of *Monilia psilosis* [*R.A.M.*, vi, p. 32], *M. tropicalis*, *M. krusei*, *M. macedoniensis*, *M. albicans* [all these so-called *Monilia* species probably belong to the genus *Candida* Berkhout: *R.A.M.*, iii, p. 556] and *Madurella mycetomi*, all of which changed the substratum from olive-green to yellowish-orange. This yellow acid reaction of the fungus colonies furnished a decided contrast to the blue alkaline reaction produced by intestinal bacteria.

S[CHENK] (P. J.). **De zwam Fusarium.** [The fungus *Fusarium.*] —*Floralia,* xlvii, 39, p. 615, 2 figs., 1926.

The writer recently observed the occurrence of an orange or lilac to pink species of *Fusarium* on the dead patches on the root collar of wilted asters [*Callistephus chinensis*: *R.A.M.*, v, p. 491]. Material of *Helianthus sparsifolius* was also received showing a black discoloration and shrivelling of the stems, which broke and fell over some distance below the flower. A species of *Fusarium* was found to be involved in this case also. A list is given of various other cultivated plants liable to the attacks of these fungi in Holland. In addition to the destruction of infected material, the writer recommends disinfection with an uspulun solution (40 gm. in 10 l. per sq. m.), and, if necessary, the immersion of the seed in a solution of the same preparation at the rate of 25 gm. in 10 l.

DE SOUSA DA CAMARA (M.). **Novae fungorum species duae, Hederae helicis parasiti propeque Colares (Sintra) collectae.** [Two new species of fungi parasitic on *Hedera helix* collected near Colares (Sintra).]—Reprinted from *O. Instituto,* lxxiii, 3, 2 pp., 1 pl., 1926.

Latin diagnoses are given of two new parasitic fungi found simultaneously attacking ivy (*Hedera helix*) near Colares (Portugal) in October, 1923, and named by the author *Sphaerulina steganostroma* n. sp. and *Phoma inclusa* n. sp. As the ascospores of the former, together with some other species of *Sphaerulina*, are biseptate, the author proposes a new genus, *Sphaerialea*, to contain these forms.

PAPE (H.). **Eine für Deutschland neue Blattfleckenkrankheit der Dahlien.**—[A leaf disease of Dahlias new to Germany.]—*Gartenwelt,* xxx, 40, pp. 632–634; 42, pp. 666–667, 5 figs., 1926.

Since 1924 a disease of dahlias, characterized by the development, chiefly on the lower leaves, of pale to yellowish-green, spherical spots, 2 to 10 mm. in diameter, has aroused considerable attention in Germany. The spots, which traverse the whole thickness of the leaf tissue, gradually expand, often assuming an irregularly polygonal form, and turn greyish-brown in the centre, surrounded by a light halo. On older, yellow leaves the tissues round the brown centres remain green for some time, and the spots thus appear encircled by a dark halo. Eventually the spots become greyish-brown and dry, with a dark brown border, the dead tissues falling out and giving a shot-hole appearance to the leaves. The spots are mostly delimited by the larger veins. The petioles may also be affected, the spots on them being of an elongated oval, sometimes almost linear shape.

Microscopic examination of the diseased tissues reveals great numbers of the globular, light brown spores, measuring 10 to 16 μ in diameter and furnished with a smooth membrane 1·5 to 2·5 μ in thickness, of *Entyloma dahliae*, the morphology of which is briefly described. The fungus causing a similar disease in Belgium, Holland, and France [*R.A.M.*, v, p. 429] is thought to be this species and not *E. calendulae,* and it is suggested that it is a recent intro-

duction to Europe, possibly from South Africa, where it was first collected in 1911.

Fresh infection occurs in the spring by means of the over-wintered spores. The disease does not appear to be transmissible by the tubers. Cuttings in the nurseries inspected by the writer in 1925 and 1926 were found to be heavily infected, possibly through the use of infected soil in the frame. Infection on plants raised from tubers is thought to be due to the adhesion of diseased material to the stumps of the cut stems. Humidity, late planting, and deficiency of lime appear to favour the disease. On the whole cactus dahlias seem to suffer most from leaf spot, Weltfrieden, Salmonea, Vieil d'Anvers, and Willkommen being very severely attacked in 1926, while the so-called pompon varieties are relatively resistant.

The damage caused by the fungus lies chiefly in the reduction of the assimilatory capacity of the leaves, leading to poor development of the tubers.

Frequent applications of a standard fungicide, in addition to careful cultivation, are probably to be recommended.

Wolf (F. A.). **Brown leafspot of Leather Leaf Fern.**—*Journ. Elisha Mitchell Sci. Soc.*, xlii, 1–2, pp. 55–62, 2 pl., 1926.

Ferns are grown commercially on a fairly extensive scale in Florida, the leather leaf fern (*Polystichum adiantiforme*) being one of those thus cultivated in large ferneries. The author describes a leaf spot disease which has caused a considerable amount of damage under such conditions. The fronds are rendered unsightly by reddish-brown lesions, which fuse and later involve large areas. A fungus was isolated from these spots and grown in pure culture; it proved to be a new species of *Cylindrocladium*, to which the name *C. pteridis* is given. Its pathogenicity was established by inoculation tests, *Dryopteris normalis* and *Nephrolepis exaltata* also proving susceptible. A smaller-spored, saprophytic form belonging to the same genus was also isolated from the spots, but whether this is to be regarded as a distinct species is doubtful. The only practical method of control suggested is the excision of all affected fronds.

Troussova (Mme N. P.). Грибные болезни Красного Клевера. [Fungal diseases of Red Clover.]—*Труды Маточного Семенного Разсадника Кормовых Трав "Узкое", вып. I, Отчет за 1924–1925 год.* [*Trans. of Parent Seed Nursery of Fodder Grasses 'Ouzkoyé', part I, Report for the year 1924–1925*], published by the Moscow Land Administration Section, pp. 96–102, 4 col. pl., 1926.

During the agricultural year under review, the Moscow Plant Protection Station studied the varietal resistance of red clover [*Trifolium pratense*] to clover rot, *Sclerotinia trifoliorum* [*R.A.M.*, iv, p. 481], and to a blossom mould caused by *Botrytis anthophila* [ibid., iii, p. 40] which was first described by Bondartzeff [A. S. Bondartzeff, Notes of the Seed Testing Station, St. Petersburg, 1914]. The results indicated that *S. trifoliorum* is almost equally pathogenic to both early and late varieties of red clover, the highest incidence (11 per cent.) being recorded on the varieties originating

from the central black soil wheat zone of Russia, and the lowest (0·36 per cent.) on the local commercial varieties. Some notes are also given on the biology of this fungus. The incidence and severity of *B. anthophila* were considerably higher on the late-flowering varieties, this being attributed chiefly to the agency of bees, which are most active in disseminating the disease during the flowering stage of these varieties. The seed produced by diseased flowers was markedly smaller and lighter than that from healthy flowers, counts giving 692 and 583 seeds to the gram from diseased as against 633 and 546 seeds from healthy flowers in the late and early varieties, respectively.

The other diseases of red clover under observation at the Station were *Uromyces trifolii* [ibid., iv, 170], with an incidence of about 80 per cent.; *Ascochyta trifolii* [ibid., iv, p. 716]; and *Gloeosporium caulivorum* [see next abstract].

WELLENSIEK (S. J.). **Waarnemingen over de Klaverstengelbrandziekte.** [Observations on anthracnose of Clover.]—*Tijdschr. over Plantenziekten*, xxxii, 10, pp. 265–302, 4 pl., 1926.

Anthracnose of clover (*Gloeosporium caulivorum*) [*R.A.M.*, v, p. 431], the symptoms, history, distribution, economic importance, and other features of which are fully discussed, is stated to be responsible in certain years for heavy damage to red clover [*Trifolium pratense*], the chief Dutch forage crop.

The fungus was readily isolated from diseased stems. Typical *Phoma*-like pycnidia are formed in culture, whereas only acervuli have been found in nature. The conidia produced in culture are considerably smaller than those formed naturally (8 by 2·4 μ, compared with 18·3 by 4·3 μ) and are cylindrical instead of being sickle-shaped. No perfect stage was observed. The pycnidia often produce very slender spore-tendrils, while in other cases the spores are forcibly ejected as a powder. The minimum, optimum, and maximum temperatures for mycelial growth and spore germination were found to be 4°, 20°, and 28° C., but the spores germinated well down to 8°. Light does not appear to influence the rapidity of mycelial growth, but affects the general habit of the latter, a greater abundance of aerial mycelium being formed by cultures exposed to electric light. In some of the cultures the phenomenon of sectoring was observed, a white saltant being thus produced on several occasions.

The fungus may hibernate in the leaf stalk, and it was also found capable of enduring a temperature of −22° C. for at least two weeks in sterilized soil. Clover grown from seed sown in infected soil contracted the disease in a severe form.

Seedlings were inoculated in the greenhouse by spraying with a spore suspension, while mature plants were infected by the direct application of the inoculum from a culture to unwounded stems or petioles. It would appear from the results of the author's experiments that the young, growing organs of the plants are infected by overwintered diseased stalks in the spring, and the spores formed on the newly infected parts secure the dissemination of the fungus during the growing season of the host.

Infection is favoured by a temperature of about 20° C. and by extreme humidity, especially if associated with dense planting. On the other hand, drought apparently accentuates the susceptibility of the plants.

The writer's experiments with over 3,000 plants grown from seed from 32 fields (many of which were heavily infected), failed to support the widely held view that anthracnose of clover is transmissible by the seed. Not only were plants raised from the seed of naturally infected plants perfectly healthy, but 374 individuals grown from the seed of artificially inoculated plants showed no signs of the disease. It is probable, however, that fragments of diseased plant parts adhering to the seeds contribute to the spread of infection.

The results of inoculation tests carried out in 1925 and 1926 showed that all forms of *T. pratense* are more or less susceptible, while infection was also produced on *T. incarnatum*, mature plants of *Medicago lupulina*, and *Onobrychis sativa*. *T. hybridum* is very resistant, and *T. repens*, *M. sativa*, seedlings of *M. lupulina*, *Lotus corniculatus*, *Anthyllis vulneraria*, and *Ornithopus sativus* are practically immune. A study of the relative susceptibility of over 400 plants of Roosendaal red clover showed great differences in individual reaction to infection.

Three other clover anthracnose fungi have been described, namely, *Gloeosporium trifolii*, *Colletotrichum trifolii*, and *C. destructivum* [*R.A.M.*, iv, p. 351]. The writer's experiments showed wide differences in the cultural characters of *G. caulivorum* and *C. trifolii*, the latter making much more rapid growth and forming a greater profusion of spores. *C. trifolii* also caused severe infection on *M. sativa*, which is immune from *G. caulivorum*. The other two species were not available for comparison.

The following control measures are recommended: immediate mowing of the fields when infection begins to spread; rotation of crops; fairly wide spacing of the plants, which may be mixed with resistant or immune crops; the use of absolutely clean seed free from debris; and the cultivation of resistant varieties obtainable by selection or hybridization.

Principales parasitos que dañan el cultivo de la Alfalfa en la República Argentina. [Principal parasites which damage the Lucerne crop in Argentina.]—*Min. Agric. Nac. (Buenos Aires), Secc. Prop. e Inform. Circ.* 645, 17 pp., 3 pl., 1926.

The following diseases of lucerne which are said to cause considerable damage in the Argentine Republic are briefly described in popular terms, and suitable control measures recommended.

Rhizoctonia violacea [*R. crocorum*] is favoured by soil acidity and excessive moisture. The application of lime should serve as a preventive. If the attack is generalized, it may be necessary to avoid the sowing of lucerne or other susceptible plants on the infected area for at least three years. In less severe cases, the isolation of diseased patches by means of trenches and the burning of the infected plants is recommended. The application to the soil of carbon bisulphide at the rate of 250 to 300 grams, or formalin at 60 grams, per sq. metre will serve to eliminate the fungus.

Pseudopeziza medicaginis is of frequent occurrence, and apparently not influenced by the prevailing moisture conditions. The only means of control appears to be to cut or feed off the lucerne in the early stages of attack. If the disease is seen on young plants, these should be cut at a height of 10 cm.

Uromyces striatus, although not as severe as the last, causes losses amounting sometimes to 5 per cent. of the crop. Early cutting and good drainage in moist soils are advised.

Peronospora trifoliorum is very prevalent, especially in the spring and early summer if the weather is warm and damp. The mildness of the attack, however, is such as to render unnecessary the early cutting of the crop, and the disease disappears with the first spring cut.

The following diseases of minor importance are also mentioned: *Urophlyctis alfalfae, Phyllosticta medicaginis, Septoria medicaginis*, and *Gloeosporium medicaginis*.

ZELLER (S. M.). **Species of Nectria, Gibberella, Fusarium, Cylindrocarpon, and Ramularia occurring on the bark of Pyrus spp. in Oregon.**—*Phytopath.*, xvi, 9, pp. 623–627, 3 figs., 1926.

In connexion with a study of European canker of apple and pear trees [*R.A.M.*, v, p. 675], the writer has been engaged for several years on the examination of material suspected to be the ascogenous or conidial form of *Nectria galligena* or closely related species. In this paper an annotated list is given of 13 species of this group of Ascomycetes and Fungi Imperfecti, which are closely linked in taxonomic literature, found during this work.

The following species are parasitic: *N. cinnabarina* on pear, *N. galligena* on apple and pear, *Gibberella baccata* on apple, and *Fusarium oxysporum* on apple.

The conidial stage of *G. baccata* (*F. lateritium*) was found fruiting on small cankers on apple trees. Infection apparently starts at the leaf scars, in the buds of small twigs, or in lesions produced by the woolly aphis. The sporodochia rupture the epidermis of the bark and appear as brick-red pustules about 1 mm. in diameter.

Two young apple trees suffering from winter injury were completely covered above the main crotch with the sporodochia of *F. oxysporum* which ruptured the epidermis. The branches were infected for distances of four or five feet. According to information received from Wollenweber, this is the first record of *F. oxysporum* on the apple.

CARNE (W. M.). **Root rot of fruit trees due to Armillaria mellea.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iii, 3, pp. 429–432, 4 figs., 1926.

Root rot due to *Armillaria mellea* causes serious damage to fruit trees in Western Australia. Citrus trees are particularly affected, although it is also found on stone fruits, apples, pears, grapes, mulberries, and passion fruit [*Passiflora edulis*], as well as on potatoes. The principal source of infection appears to be the presence in the soil of roots and stumps of native trees. This is especially noticeable on land from which the 'marri' (*Eucalyptus calophylla*) has

been cleared. Wattles [*Acacia* spp.] are also very susceptible to attack and suffer considerably. The most obvious symptoms of the disease are yellowing of the foliage and reduced growth, followed by subsequent death of the tree. In an advanced stage, clusters of mushroom-like bodies may be found in the autumn and winter at the base of the stem. If the roots on only one side are affected, the tree may live for years.

The spread of the disease may be prevented by uprooting and burning badly affected trees and treating the soil with a dressing of quicklime or iron sulphate. In slightly affected cases all rotted areas should be cut out, and the parts treated with iron sulphate, or a paste consisting of 1·5 lb. copper sulphate, 4 lb. quicklime, and 1·5 gall. water.

GARDNER (M. W.), GREENE (L.), & BAKER (C. E.). **Spraying tests for the control of Apple blotch.**—*Trans. Indiana Hort. Soc., 1925*, pp. 134–147, 1 chart, 1926.

Further spraying tests for the control of apple blotch (*Phyllosticta solitaria*) were carried out in Indiana in continuation of those previously described [*R.A.M.*, iii, p. 276]. The degree of control of fruit, petiole, and twig infection given by the various applications is shown in tabular form.

The results obtained by spraying the Northwestern variety in 1922, and the Oldenburg variety from 1921 to 1925 inclusive, indicate the beneficial cumulative effect of spraying during previous seasons. The control of canker infection was approximately proportional to the control of petiole infection obtained during the year in which the wood in question was produced. As a petal-fall spray (the date varying with different seasons), lime-sulphur was effective, except in 1922 when a 2–4–50 Bordeaux mixture proved much superior. Spraying two, four, and six weeks after the petal-fall spray has given a satisfactory control each season. A 2–4–50 or 2–6–50 Bordeaux proved as effective as the 4–6–50 strength and was evidently more reliable than lime-sulphur in three seasons out of the five, the other two being seasons of mild infection. The 1–3–50 Bordeaux, however, was not so effective as the others.

BROOKS (C.) & COOLEY (J. S.). **The control of Apple scald with shredded oil paper.**—*U.S. Dept. of Agric. Circ.* 396, 4 pp., 1 graph, 1926.

The results of further experiments to test the value of shredded oiled paper in the control of scald in apples packed in barrels [*R.A.M.*, iv, p. 291] are described. Seven different varieties of apples were used, and scald was reduced from an average of 67 to 4 per cent., after periods varying from four to nine months from picking, by the use of this paper. A quantity not less than 1½ lb. per barrel was found to be necessary for effective control, and the paper should contain at least 15 per cent., and preferably 18 to 20 per cent. or more, of its weight in oil. To ensure an even distribution of the oiled paper, not more than two layers of apples across the barrel should be run in at one time. In the experiments the paper was well distributed, so that practically every apple was in contact with it. The importance of covering the surface layers is

emphasized: cases have been observed when scald was confined almost entirely to these layers if left without paper. The method adds 20 to 25 cents per barrel to the cost of packing, and in many cases 50 cents to a dollar or more additional profit per barrel was obtained. Equally good results were obtained with apples in hampers, baskets, and boxes.

LAUBERT (R.). **Eine merkwürdige neue Schädigung der Winteräpfel.** [A remarkable new injury of winter Apples.]—*Obst- u. Gemüsebau*, lxxii, 23, pp. 348–349, 2 figs., 1926.

At the end of October and beginning of November, 1926, the writer observed an unusual spotting of Golden Pearmain apples at the Dahlem (Berlin) market. The circular, dark to brownish-grey or often olive-coloured spots were sharply divided from the healthy golden-yellow skin by a narrow brown line. A brownish lenticel was almost uniformly observed in the centre of the slightly concave spots, which were irregularly distributed over the fruit, often more profusely on the calyx than on the stalk half. The spots measured 1 to 4 mm. in diameter and were so numerous that 3 to 5 or even as many as 25 might occur on 1 sq. cm. of skin. Transverse sections through the affected fruit revealed small, air-filled cavities below each spot. Under the epidermis there were several layers of a small-celled tissue with thickened cell walls. The neighbouring cells showed a browning of the membranes, and there was a dark boundary line between the diseased and healthy tissues, but no formation of phellogen.

The cause of the disease remains obscure, but it is thought that the storage rooms may have retained some fumes of the noxious gases used in disinfection.

DAY (L. H.). **Winter practices that check Pear blight.**—*Better Fruit*, xxi, 4, p. 14, 1926.

Particulars are given of the winter treatment of pears affected by fire blight [*Bacillus amylovorus*] by various cultural measures, scarification of the overwintering cankers, and disinfection with cyanide of mercury and corrosive sublimate (8 gms. of each in a quart of water, and then three quarts of glycerine added), reference to which has been made in previous papers [*R.A.M.*, iv, p. 174; v, p. 673]. In scarifying the hold-over cankers, the diseased bark should be shaved away until practically all the diseased tissues are removed, but care must be taken not to expose the tissues so near to the cambium that the disinfectant will reach and kill large patches of the latter. When the canker has gone too deeply for this to be avoided the branch should be amputated. Scarification of winter cankers should extend four to six inches beyond the visible internal signs of infection.

DEL CAÑIZO (J.). **Tratamiento de la 'roña' del Peral (Fusicladium pirinum [Lib.] Fuck.).** [Treatment of black spot of Pear (*Fusicladium pirinum* [Lib.] Fuck.).]—*Bol. Estac. Pat. Veg.*, i, 3, pp. 102–105, 4 figs., 1926.

Black spot of pear (*Venturia pirina*) is stated to have become prevalent in Spain. The fungus [a brief description of which is

given] is found on leaves and fruits and severe attacks also affect the branches, causing splitting of the bark. The Rome variety is the most susceptible to attack in the Aragon orchards, and Donguindo in Rioja. The less juicy varieties appear to be more resistant.

The destruction of infected leaves and fruits, and the pruning off and burning of all dead or injured twigs are advised. The cleaning of the trunk and branches to remove dead and cracked bark and painting them afterwards with a concentrated solution (15 to 20 per cent.) of iron sulphate and water, or with Bordeaux mixture (3 to 4 per cent. copper sulphate) is stated to be another effective means of control. A series of applications from the spring onwards of 1·5 per cent. Bordeaux mixture is recommended. Poor cultural conditions (damp and badly aerated soil, inadequate pruning, and lack of manure) have a marked influence on the severity of the attack.

ZELLER (S. M.). **A blossom and spur blight of Pear caused by a strain of Botrytis cinerea Pers.**—*Journ. Agric. Res.*, xxxiii, 5, pp. 477–482, 5 figs., 1926.

This report is claimed to be, as far as the writer is aware, the first record of a blossom blight of pear caused by *Botrytis cinerea*. The disease was first described by him in 1920 as attacking the fruiting spurs of the pear, since when it was found, in the Umpqua and Rogue River valleys, Oregon, also to attack the blossoms at all stages of development, chiefly of the Anjou, Bartlett, Winter Nelis, Comice, and Bosc varieties, with a severity decreasing in the order mentioned.

According to observations, infection occurs through the flower parts, the first visible symptom being the wilting of one or more flowers or flower buds on a spur. In one or two days it spreads through the flower pedicel to the adjacent flowers, and continues rapidly down the spur and for some distance into the parent branch. As the infection usually takes place at a time of vigorous growth of the branch, the further progress of the fungus is rapidly checked by the production of cork cambium around the diseased area, when the base of the affected spur becomes cankerous in appearance. Sclerotia develop in cracks and on the surface of the diseased areas in the autumn. During the earlier stages the causal organism can be easily isolated from the diseased tissues. Very occasionally infection may also occur after the setting of the fruit, in which case the fungus seldom advances beyond the suberized tissue of the normal abscission layer at the base of the pedicel.

The pathogenicity of the organism was proved in inoculation experiments either by spraying a spore suspension in distilled water on the flower parts, or by dusting the latter with dry spores, or by injecting spore suspensions into the bark of spurs with a hypodermic needle, all of which gave a high percentage of infections both in the laboratory and in the field. When the conidia were dusted on the blossoms, infection started in one of four places, namely, either in the stamens, in the styles, in the sepals or, in a very few cases, in the small bracts on the flower pedicels. In al

cases mycelial invasion of the tissues proceeded very rapidly. Microscopical examination showed that infection may take place from conidia adhering to the epidermal hairs of the floral parts, the tips of the germ-tubes entering directly through the wall of the hairs. In no instance was any indication of mechanical pressure on the underlying cell wall, or a peg-like growth being forced through the wall from a superficial germ-tube, observed. After penetration into the hair, the germ-tube rapidly advances towards the underlying epidermal cell.

No means of control were tried against the disease. It is pointed out, however, that, since infection is carried over from one season to the next in the spurs that were attacked during the previous year, as well as in the debris of other diseased parts, control by the removal of the latter would be ineffectual.

Control of brown-rot in stone-fruits. Recent experiments at Henderson.—*New Zealand Journ. of Agric.*, xxxiii, 3, pp. 170–173, 1926.

The results of experiments carried out at Henderson (New Zealand) during the season of 1925–6, indicate that Bordeaux mixture is preferable to lime-sulphur as a delayed dormant spray on peach trees. Leaf curl [*Taphrina deformans*] was more effectively controlled by the former, and the foliage was better developed than after the use of lime-sulphur, though there was no significant differences between the two in the control of brown rot [*Sclerotinia cinerea*: *R.A.M.*, ii, p. 165]. The spring forms of bud rot, blossom rot, and twig rot caused by the latter disease were not completely controlled by any of the sprays, five applications of which were given after the delayed dormant, namely, at early pink, petal fall, three weeks later, half grown, and prior to ripening. Reasonably satisfactory control of summer fruit rot was given by atomic sulphur (8lb. to 100 galls. water) and the treatment appeared to exercise a beneficial influence on the general health of the trees. Atomic sulphur 4 lb., plus lime-sulphur ½ gall., per 100 galls. water gave fair control. Lime-sulphur proved unsatisfactory. The severity of the spring forms of infection was found to differ greatly according to the variety.

Ludwigs [K.]. **Beobachtungen über Krankheitserscheinungen am Obst.** [Observations on pathological manifestations in fruit.]—*Obst- u. Gemüsebau*, lxxii, 18, pp. 265–266, 4 figs., 1926.

Brief observations are made on various pathological manifestations occurring in Brandenburg orchards during 1926, when highly abnormal weather conditions were prevalent. Sour cherries [*Prunus cerasus*] were severely attacked by scab (*Fusicladium cerasi*) and *Monilia* [*Sclerotinia*: *R.A.M.*, iv, p. 85]. Directions are given for distinguishing these two diseases, which are stated to be frequently confused. A preventive treatment with 2 per cent. Bordeaux mixture is recommended against *F. cerasi*, but the *Sclerotinia* disease is apparently controllable only by very careful sanitation of the orchards.

STEVENS (N. E.). **Occurrence of the Currant cane blight fungus on numerous hosts in the southern States.**—*Mycologia*, xviii, 6, pp. 278–282, 1 map, 1926.

The currant cane blight organism (*Botryosphaeria ribis chromogena* G. & D.) has already been shown to occur on several other hosts besides the currant both within and south of the limit of cultivation of the latter [*R.A.M.*, iii, p. 725; iv, p. 636]. The writer in the present paper shows that the fungus has also been found on, and isolated from, at least 14 other hosts, many of which are native species, in Georgia and Florida, and one in Cuba. *B. ribis chromogena* appears to be pathogenic to currants only towards the south of their area of cultivation. These two facts taken together suggest that the fungus was originally confined to native hosts of southern range, and that the introduced species of currant have proved susceptible to an already present parasite. The fact that the disease has not been recorded from Europe lends support to this view.

WEIR (J. R.). **Observations on Calyptospora columnaris and Peridermium ornamentale.**—*Mycologia*, xviii, 6, pp. 274–277, 2 pl., 1926.

The life-cycle of *Calyptospora columnaris* as a heteroecious fungus on *Vaccinium* and *Abies* spp., is again confirmed by the writer's inoculation experiments on *V. membranaceum* and *A. lasiocarpa*. Comparing this species with *Peridermium ornamentale*, which is also associated with rust on *Vaccinium*, and has *Abies* sp. as its aecidial host, he suggests that although somewhat similar in microscopic characters, yet their differences are sufficient to warrant their being regarded as distinct species. In his opinion this *Peridermium* is probably the aecidial stage of another species of *Calyptospora*, but he grants the possibility of the two being identical, the differences in aecidial characters being due to the vigour of the host. The question of the life-history and identity of these fungi is important owing to the seriousness of the *Vaccinium* rust, especially on mountain cranberries (*V. vitis-idaea* and *V. corymbosa*) in the eastern parts of the United States.

DEMAREE (J. B.). **The Pecan scab fungus.**—Abs. in *Phytopath.*, xvi, 9, pp. 642–643, 1926.

The causal organism of pecan [*Carya pecan*] scab has for many years been known as *Fusicladium effusum* [*R.A.M.*, v, p. 750] on the supposition that its conidia were produced singly or in pairs on short, unbranched hyphae. It is now known, however, that the scab fungus forms long, acropetalous chains of conidia on either simple or branched conidiophores, while its appearance in the living host tissues and its cultural characters indicate a close connexion with the form genus *Cladosporium*. The morphological resemblances between the scab organism and *C. carpophilum* are regarded as sufficiently marked to suggest congeneric relationship, and further reasons for transferring the former to the genus *Cladosporium* will be given in the full paper.

BOYD (O. C.). **Report on the experiment of 1925 for Pecan scab control at Baconton, Ga.**—Abs. in *Phytopath.*, xvi, 9, p. 644, 1926.

An experiment was conducted in 1925 to test the relative value of different fungicides in the control of pecan scab [previously known as *Fusicladium effusum* but now transferred to the genus *Cladosporium*: see preceding abstract] on 16-year-old Delmas, Schley, and Alley trees. The preparations used were Bordeaux mixture 4–8–50; a home-made dust of monohydrated copper sulphate, hydrated lime, and kayso; a commercial copper-lime dust of the same formula except that there was no kayso; and a Bordeaux dust carrying an electrical charge, manufactured by the Kil-Tone Company. Five applications of the spray and nine of the dusts were given. On all the varieties the spray gave a higher degree of control than the dusts, though the latter held the disease in check on the Alley and Schley varieties. The spray was further superior to all the dusts in adhesiveness to nuts and foliage. The Kil-Tone was the least satisfactory of the preparations in all respects. The percentages of marketable Delmas nuts were as follows: 73·5 per cent. for the spray, 71·7 per cent. for the home-made dust, 37·5 per cent. for the commercial dust, and 24·2 per cent. for the Kil-Tone. Assuming the average value of the marketable nuts to be 40 cents per lb., the following increase in pounds per tree would be necessary to pay for the different treatments: spray 4·7, and 13, 20, and 13 for the dusts in the order listed. The yields actually obtained were 31·2, 32, 12·5, and 10·1 lb., respectively.

OCFEMIA (G. O.) & PALO (M. A.). **The relation of certain Philippine varieties of Bananas to the wilt disease due to Fusarium cubense E.F.S.**—*Philipp. Agric.*, xv, 4, pp. 243–244, 1926.

The occurrence of wilt disease (*Fusarium cubense*) [*R.A.M.*, v, pp. 617, 618] in a plantation of Latundan bananas in Los Baños (Philippine Islands), was first observed in 1923, and in April, 1925, practically every hill showed the typical symptoms of infection. The diseased suckers were obtained from fields in which infection was known to be present since 1920. Only 7·47 per cent. of the diseased stools showed the presence of root grubs (*Cosmopolites sordidus*). The 107 affected plants were replaced in September, 1925, by suckers of the following varieties: Buñgulan, Incarnibal, Lacatan, Saba, and Ternate or Gloria. All the varieties mentioned are stated to be forms of *Musa sapientum*. The condition of these plants in regard to wilt infection is being examined every month.

HOLTON (E. C.). **Insecticides and fungicides.**—*Indus. & Engin. Chem.*, xviii, 9, pp. 931–933, 1 fig., 1926.

This is a brief but interesting historical survey of the development of insecticides and fungicides from the earliest times (with references to Pliny's Natural History) to the present day. The preparations discussed include sulphur and sulphur compounds; timber preservatives such as compounds of mercury and zinc, fluorides and silicofluorides of the alkalies and alkaline earths, creosote, and arsenated petroleum; various copper compounds; and formaldehyde.

RÖSCH (A.). **Eine neue Methode zur schnellen Prüfung von Beizmitteln.** [A new method for the rapid testing of disinfectants.]—*Pflanzenbau*, iii, 7, pp. 107–109, 1926.

After a brief discussion of the various methods in current use for testing the efficacy of fungicides, the writer describes one which has been successfully used at Leipzig for determining the value of various preparations in the control of loose smut of oats (*Ustilago avenae*) [*R.A.M.*, v, p. 547]. The method [technical details on the application of which are given] is based on the detection of infection, by microscopic examination (at 300- to 400-fold magnification), in tangential sections of the surface layers of the seedlings shortly after germination (when the shoot is 3 to 4 cm. long). The holes in the surface cell walls formed by the entry of the hyphae are readily distinguishable on the pale membrane of the seedling by the dark halo surrounding them. A fungicide can only be termed effective if there is no trace of hyphal penetration under the most favourable conditions for infection. The advantages of this method are stated to include rapidity and facility of application at any season, and the use of only a small number of seeds (20 for each fungicide to be tested).

ZIMMERMANN (F.). **Welche Beizmittel werden verwendet? Ergebnis einer Umfrage.** [What fungicides are used? Result of an inquiry.]—*Wiener. Landw. Zeit.*, lxxvi, 40, pp. 338–339, 1926.

Interesting data have been obtained as the result of a questionnaire submitted by the Plant Protection Station at Tetschen-Liebwerd (Czecho-Slovakia) to the principal land-owners, farmers, and plant breeders over an area of some 1,400,000 hect. The questions were framed to elicit information as to the comparative merits and relative suitability for various purposes of fungicides in past and present use for seed treatment.

It was apparent from the 117 replies obtained that liquid solutions of copper sulphate, uspulun, germisan, and formaldehyde are in most general use. Formerly copper sulphate and uspulun were equally popular, but the present tendency appears to favour the extended use of germisan, especially for the control of loose smut of oats [*Ustilago avenae*] and stripe disease of barley [*Helminthosporium gramineum*]. Uspulun is preferred for use against *Fusarium* of rye [*Calonectria graminicola*]. Copper sulphate still enjoys a wide popularity, notwithstanding its well-known tendency to impair the germination of treated seed-grain. Tillantin, agfa, and corrosive sublimate are used only to a very limited extent, and dusts have scarcely been tested at all.

The most striking outcome of this inquiry is the widespread popularity of germisan, which promises to replace uspulun for all general purposes. These data, based on practical experience, agree well with the results obtained at the Plant Protection Station, the authorities of which uniformly recommend germisan for general efficacy, while uspulun is advocated for the treatment of rye seed-grain and vegetables.

GOODWIN (W.) & MARTIN (H.). **The lime sulphur-calcium arsenate spray.**—*Journ. Agric. Sci.*, xvi, 4, pp. 596–606, 1926.

In continuation of their investigations on mixed sprays [*R.A.M.*, v, p. 116], the authors studied the effects of mixing calcium arsenate in place of lead arsenate with lime-sulphur, and in the present paper an account is given of the reactions occurring in this mixture before and after spraying in relation to its fungicidal and insecticidal value, and the possibility of spray injury from its use.

The effect of adding lime to dicalcium arsenate was first examined. The interaction of calcium hydroxide and dicalcium arsenate results in the formation of a continuous series of basic calcium arsenates, which are hydrolysed in aqueous suspensions. The addition of lime to dicalcium arsenate consequently had the effect of temporarily reducing the amount of arsenic in solution. Exposure to atmospheric carbon dioxide, however, caused a restoration of the solubility of the dicalcium arsenate, but the concentration of soluble arsenic was less than when dicalcium arsenate is dissolved without lime. The risk of spray injury with the dicalcium arsenate spray is, therefore, reduced when lime is added.

The concentration of soluble arsenic was also reduced by the admixture of lime-sulphur, and the reduction was carried still further when lime was added to the mixture. The result was a corresponding reduction in the risk of foliage injury.

The addition of dicalcium arsenate had no effect on the fungicidal value of the calcium polysulphides, although an excess of calcium hydroxide may exercise an adverse influence by causing a reduction in the amount of sulphur precipitated from them.

MYERS (H. B.). **Comparative fungicidal action of certain volatile oils.**—*Journ of Pharmacol. (Proc.)*, xxvii, p. 248, 1926. [Abs. in *Chem. Abstracts*, xx, 18, p. 3021, 1926.]

The following volatile oils are classified according to the comparative fungicidal activity of their saturated aqueous solutions as determined by the time required to kill certain yeasts (isolated from infections in man in which they were apparently the chief or sole invaders), which were destroyed by 1 per cent. phenol in an hour: thymol and carvacrol, 1 minute; mustard, 10 minutes; cinnamon, 30 minutes; clove, 90 minutes; eugenol, turpentine, peppermint, menthol, camphor, anise, and eucalyptol, 2 hours; and apiol and lemon, 24 hours.

HEALD (F. D.). **Manual of plant diseases.**—xiii + 891 pp., 272 figs., London, McGraw-Hill Publishing Co., 1926.

The author of this important students' text-book has adopted an arrangement and treatment of the subject matter similar to those in Duggar's well-known 'Fungous diseases of plants', with the exception that methods of laboratory technique have been purposely omitted. The twenty-eight chapters are arranged in four sections treating of (1) the history of plant pathology and symptoms of disease, (2) non-parasitic diseases, (3) virus diseases, and (4) parasitic diseases. The space (220 pages) allotted to non-parasitic and virus diseases, almost unnoticed in the earlier text-book, is a recognition of the valuable work done on them in recent years. The

mode of treatment has been to select thoroughly investigated and economically important individual diseases, and to describe each in detail under history, geographical distribution, symptoms and effects, etiology, host relations, and control, followed by an extensive list of references to the literature. Etiologically related diseases are noted briefly at the end of each chapter, accompanied by references to the literature. The descriptions of bitter pit of the apple, chestnut blight (*Endothia parasitica*), silver leaf (*Stereum purpureum*), and stem rust of cereals (*Puccinia graminis*) are good examples of the special treatment accorded to individual diseases. In the section on parasitic diseases the nomenclature of Migula is used for the bacterial pathogens, and corky [common] scab of the potato (*Actinomyces scabies*) is included in bacterial diseases, while the combination *Physalospora cydoniae* Arn. is adopted for the fungus causing black rot of the apple; the section terminates with chapters on diseases due to parasitic 'seed plants' and nematodes. The omission of a host index, apart from the general index, must be noted. The volume will doubtless become the standard general text-book in the English language on plant diseases in the temperate zones.

NAOUMOFF (N. A.). Общий Курс Фитопатологии. [General course of Phytopathology.]—Second edition revised, 504 pp., 123 figs., State Press, Moscow-Leningrad, 1926.

This text-book, designed for the use of the Higher Schools of Agriculture in Russia, is divided into four parts. In the first part, after a brief introduction explaining the aims and purposes of phytopathology as a distinct branch of botany, the diseases of plants as a whole and the relationship between host and parasite are discussed in detail; a special chapter deals with the morphology, systematic distribution, physiology, and ecology of parasitic fungi. The second part gives a description of the individual diseases caused by bacteria, actinomycetes, and by various fungi arranged by their genera. Four chapters deal with other causes of plant disease, and diseases of the mosaic type are discussed separately. The third part reviews methods of control, including the preparation of fungicides, the disinfection of seed, and the general principles of prophylaxis and therapy in plant pathology. In the last part the methods for cultivating saprophytic and parasitic fungi are dealt with in some detail. One chapter is given to the examination of seeds, cereal grain, and flour for fungous diseases and contaminations, and another to a description of the plant protection services in Russia and abroad.

Most of the illustrations are original. The book terminates with a very extensive bibliography, and with two Latin indices of the hosts and parasitic fungi mentioned in the text.

SARDIÑA (J. R.). **Zur Frage der Antikörpenbildung bei Pflanzen.** [On the question of antibody formation in plants.]—*Angew. Bot.*, viii, 5, pp. 289–303, 1926.

The writer summarizes the principal literature on the problem of antigen formation in plants, and describes a series of experiments conducted at the Biologische Reichsanstalt, Berlin-Dahlem, to ascer-

tain by methods analogous to those used in human and veterinary medicine whether agglutinins and precipitins are formed by plants inoculated with pathogenic organisms. The tests [the technique of which is fully described] were carried out with three different strains of the causal organism of blackleg of potatoes [*Bacillus atrosepticus*], *Bacterium tumefaciens*, and *Bact. campestre* [*Pseudomonas campestris*] on various species of *Opuntia*, including *O. ficus-indica* and *O. lindheimeri*, *Vicia faba*, potato tubers, tomato, and pumpkin (*Cucurbita pepo*). In no case were specific agglutinins and precipitins formed, and it is therefore concluded that the plant constitution reacts differently from the human and animal to this type of stimulus.

YOUNG (P. A.). **Facultative parasitism and host ranges of fungi.** —*Amer. Journ. of Bot.*, xiii, 8, pp. 502–520, 2 pl., 1926.

This paper is a further instalment of the results of the author's inquiry into the nature of facultative parasitism [*R.A.M.*, v, p. 621]. It illustrates, by means of cross-inoculation experiments, the facultative parasitism of species of *Alternaria*, *Macrosporium*, *Helminthosporium*, and certain other fungi, and gives a mass of information regarding the host ranges of these fungi under conditions of artificial infection.

The inoculations were carried out in the laboratory and the greenhouse, the methods used being similar to those previously described. Sixty-nine isolations of fungi were tested in 5,369 inoculations of 78 species and varieties of flowering plants. Of these inoculations, 3,602 were made on leaves in the greenhouse, 1,633 on seedlings in tubes, and 134 on fruits and bulbs in dishes. Thirty-nine cultures of *Alternaria* and *Macrosporium* were used in 2,258 of the greenhouse inoculations, and 1,165 of those in tubes.

The type of result obtained from these experiments is illustrated by the following example: *Alternaria brassicae* (Berk.) Sacc. f. *microspora* P. Brun., isolated from a cabbage leaf spot, was found to infect wheat seedlings, 60-day oats, Amber Cane sorghum (*Holcus* [*Andropogon*] *sorghum* var. *saccharatus*), cabbage, turnip, and tomato; while no infection was produced in the case of pumpkin (*Cucurbita pepo*) seedlings.

These cross-inoculation experiments resulted in 198 'new diseases', i. e., the production of disease symptoms on hosts hitherto unrecorded for the various fungi. Of this number 165 resulted from inoculations with species of *Alternaria* and *Macrosporium*.

Summarizing some of the results of this series of experiments, it was found that Red Wave wheat was infected by *Diplodia zeae*, *Cephalosporium acremonium*, *Colletotrichum nigrum*, and all cultures of *Alternaria*, *Macrosporium*, *Acrothecium*, and *Helminthosporium* placed on it, while barley, rye, oats, Yellow Dent maize, and broom corn [*Andropogon sorghum*] were infected by some of these. The criteria of infection were leaf spots developed at the point of inoculation, or internal mycelium and callosities [loc. cit.], developed within a limited period of a few days. Cabbage, radish, and turnip were infected by many of the fungi in question; species of *Alternaria* and *Macrosporium* infected tomato and soy-bean

seedling stems, and pumpkin and muskmelon developed large complex callosities when inoculated with several of these dematiaceous fungi. Onion-bulb membranes were infected with *Macrosporium iridis* and *M. parasiticum*, but other inoculations with related fungi failed to give positive results.

These cross-inoculations showed that many species of *Alternaria* and *Macrosporium*, and some of *Helminthosporium*, are facultative parasites with wide host ranges. Although infections were produced in many quite unrelated host plants, yet the failure to infect other plants suggests that, under the experimental conditions at least, their host range was not indefinite.

Phytophthora cactorum, *Sclerotinia sclerotiorum*, *Thielavia basicola*, and *Thielaviopsis paradoxa*, all destructive parasites, failed to infect most of the plants on which they were placed. *Botrytis cinerea*, *Cephalothecium roseum*, and *Fusarium* caused no infections on wheat, but *Diplodia zeae* caused a serious disease of wheat coleoptiles. None of the fungi tested by placing on wounds in apples caused distinct rots. *Helminthosporium* sp. from barley leaves was one of the most virulent parasites encountered, while *H. gramineum* infected 14 out of the 46 kinds of plants tested with it.

It is pointed out that the conditions under which these diseases were caused were very abnormal: aseptic seedlings in tubes and plants under covered bell jars are physiologically different from normal plants in the field. Nevertheless the results are thought to have a direct bearing on the problem of the susceptibility of plants to the attacks of fungi. Cabbage plants, grown under bell jars for 3 days and then removed, were found to wilt at once and die quickly. They were clearly in an abnormal condition as a result of the previous growth conditions and unable to withstand a sudden water loss. When inoculated under the jars, infection took place while the plant was in a similar abnormal physiological condition. The deduction is made that there is some correlation between susceptibility and altered conditions of transpiration. This was borne out by the fact that *Alternaria* and *Helminthosporium* infected many plants when covered by bell jars, and only a few when the transpiration conditions were allowed to become more normal.

KARSNER (H. T.) & SAPHIR (O.). **Influence of high partial pressures of oxygen on the growth of certain molds.**—*Journ. Infect. Dis.*, xxxix., 3, pp. 231–236, 1 fig., 1926.

The authors describe briefly a series of experiments showing that concentrations of 76 per cent. or more of oxygen exercise a definite inhibitory effect on the growth of certain parasitic fungi, including various species of the dermatophytes, *Trichophyton*, *Epidermophyton*, *Microsporon*, *Sporotrichum*, *Achorion*, *Mastigocladium*, and the causal organism of Madura foot [*Madurella*: *R.A.M.* v, p. 429], and also on the plant parasites *Sclerotinia fruticola* [*S. cinerea*: *R.A.M.*, iv, p. 175] and *Monilia candida* [? *M. fructigena*]. *Cryptococcus hominis*, *Allescheria boydii*, and *Alternaria* sp. showed no reduction of growth in concentrations of 96 to 98 per cent. oxygen. In no case was the organism killed by the concentrations used, nor was the production of pigment modified.

SCHAFFNIT (E.). **Zur Erforschung der Mosaikkrankheiten.** [On the investigation of the mosaic diseases.]—*Angew. Bot.*, viii, 5, pp. 304–313, 1926.

In this paper, read before the Association of German Naturalists and Doctors at Düsseldorf in September, 1926, the history of the investigation of mosaic diseases of plants is briefly outlined, with references to the relevant literature. The present status of the problem is discussed in the light of recent discoveries, but the view that virus diseases are responsible for the so-called 'degeneration' of potatoes in the Rhineland is not accepted, the latter being regarded as much more an ecological problem, not directly affected by disease. Suggestions are made for the prosecution of further researches along the following lines: inquiry into the origin of the virus and its action on the infected cell and the organism; further investigations of obscure types of mosaic; analytical examination of the influence of environmental factors on the development of the plant and course of the disease; relationship and inter-transmissibility of mosaic diseases of plants of the same family, including wild plants; and investigation of varietal susceptibility with a view to the acquirement of resistant varieties and strains.

TOMPKINS (C. M.). **Influence of the environment on Potato mosaic symptoms.**—*Phytopath.*, xvi, 9, pp. 581–609, 5 pl., 6 graphs, 1926.

Studies were carried out at Madison (Wisconsin) and Eagle (Colorado) to determine the influence of air and soil temperature, soil moisture, humidity, light, and nutrition on the symptoms of a type of mosaic determined by Schultz as rugose mosaic [*R.A.M.*, iii, p. 548] on Wisconsin Triumph potatoes.

Under greenhouse conditions air temperature was found to be the sole factor affecting the amount and intensity of the symptoms on the foliage. Experiments conducted in constant air-control chambers indicated that relatively short exposures to temperatures above the critical point (23° to 24° C.) were sufficient to mask the symptoms of the disease [*R.A.M.*, iv, p. 656]. With intermittent exposures the rate of masking was found to depend largely on the duration of exposure, on the degree to which the temperature exceeded the critical point, and on the age of the leaves. In general, the higher the temperature the more rapid the masking, which occurred earlier and made quicker progress in young tissues than in older leaves, except at 30° to 40°, when young and old tissues were equally affected.

Differences in air temperature accounted for marked variation in leaf area produced on mosaic plants subjected to the same period of exposure. Masked mosaic plants exposed to low temperatures always redeveloped the characteristic symptoms of the disease.

Symptoms of mosaic on the Triumph variety appeared in the field at an altitude of 8,000 ft. at 24° and above, though mottling was less pronounced than in lower situations.

High soil temperatures (30° to 35°) were found to be of some importance in masking mosaic symptoms during the earlier stages

of growth, regardless of the amount of moisture present in the soil or of the air temperature favourable for the appearance of mottling.

Variations in soil moisture, atmospheric humidity, light, and in the supply of three essential elements for plant growth (monobasic potassium phosphate, calcium nitrate, and magnesium sulphate) failed to decrease or intensify the symptoms.

Histological studies indicated that masked mosaic leaves differ markedly in structure from healthy ones, e.g., in the reduction in size, in both axes, of the palisade cells and their compact arrangement, and in the increase in number of spongy parenchyma cells with the elimination of intercellular spaces.

The time of onset and duration of the period of masking were found, by examination of climatological records, to vary in different potato-growing regions. Thus, in Colorado, the period of masking is most likely to begin about the third week of growth and continue throughout the season. In Florida and Louisiana the corresponding date is from the tenth week onwards, while in Maine, New York, and Wisconsin masking is liable to occur from the fourth to the thirteenth week.

Exposure to intermittent air temperatures is regarded as of fundamental importance in connexion with the tuber-index method of testing seed-potatoes [*R.A.M.*, v, p. 626], in seed-potato inspection and certification, and in experimental studies on mosaic.

ATANASOFF (D.). **The stipple-streak disease of Potato. A complex problem.**—*Bull. Soc. Bot. de Bulgarie*, i, pp. 43–52, 1926. [English.]

This is a brief account of the author's further experiments on the response of different varieties of potato to inoculation by tuber grafting with stipple-streak disease [*R.A.M.*, iv, p. 563]. The work was done at the Instituut voor Phytopathologie at Wageningen, Holland, and included the following varieties: Schotsche Muis (Midlothian Early), Immune Ashleaf, Koksiaan (which has since been identified as the English variety May Queen and not Jersey Nonsuch, as erroneously stated in the author's former paper), Bravo, Eigenheimer, Roode Star, Zeeuwsche Blauwe, Green Mountain, Institut de Beauvais, Triumph (Dutch), and Bintje. All the material used was disease free, with the exception of Ashleaf (100 per cent. mosaic), Roode Star (100 per cent. net necrosis), and Zeeuwsche Blauwe (100 per cent. stipple-streak).

All the varieties tested were found to be susceptible to infection, but they differed widely in the degree to which they were affected as the resulting symptoms varied from those of typical to slight stipple-streak, crinkle, and mosaic to complete absence of any disease symptoms whatever. As some varieties, such as Bravo, Eigenheimer, Roode Star, &c., have never been seen in nature to exhibit symptoms of this disease, even when grown alongside varieties severely affected with stipple-streak, though usually infected with crinkle and mosaic, the suggestion is made that some proportion of the latter diseases may perhaps be caused by the virus of stipple-streak. The variety Zeeuwsche Blauwe, as far as studied by the author and perhaps in its entirety, is always a carrier of the stipple-streak virus

although under natural conditions it never shows even the slightest symptom of disease. This is of considerable practical importance, because the existence of such latent carriers is a constant unsuspected source of infection, and because such varieties supply a stock for the development of tolerant varieties.

In terminating the author states that in his opinion the existence of a practically unlimited number of potato varieties, and more particularly their introduction into widespread cultivation, is undesirable, and that all present requirements could be fully met by some ten varieties.

ATANASOFF (D.). Мрежестата некроза и черната шарка по Картофа. (Предварително съобщение.) [Net necrosis and stipple-streak of the Potato. (Preliminary report.)]—*Annuaire de l'Univ. de Sofia, V. Fac. Agron., (1925–6)*, iv, pp. 1–6, 1926. [Bulgarian, with English translation.]

The author states that the evidence collected by him during the last three years regarding the nature of net necrosis of the potato contradicts the findings of Gilbert and of Schultz and Folsom [*R.A.M.*, iii, pp. 415, 548], and shows conclusively that it is not a symptom of leaf roll but a different disease. It is not a disease of the tuber alone, but manifests itself in various ways also on the leaves of the affected plants, in which the symptoms vary, according to the potato variety, from Quanjer's aucuba mosaic type to complete absence of this discoloration, or to its development only at the beginning or at the end of the growing period.

The part of this paper relating to stipple-streak is a condensed version of the paper noticed in the preceding abstract.

CUNNINGHAM (G. H.) & NEILL (J. C.). **Corticium disease of Potatoes. Further experiments and advice for control.**—*New Zealand Journ. of Agric.*, xxxiii, 3, pp. 174–175, 1926.

The acidulated mercuric chloride method of disinfecting potato tubers, although giving excellent results in the laboratory tests [*R.A.M.*, iv, p. 438], has failed to control the disease caused by *Corticium* [*solani*] in the field. In the field experiments described in this paper, the solutions recommended in the foregoing tests [loc. cit.] were used. The dip did not materially affect the yield, nor did any damage result even when solutions of a much greater concentration than those previously tested were used, unless the period of immersion was considerably prolonged. The disease, however, was not adequately controlled. Consequently, this method of treatment of the seed tubers is not recommended, and until a more satisfactory way of combating this disease has been found, it is advisable to discard all tubers showing signs of a heavy infestation with sclerotia.

ROLET (A). **La conservation des Pommes de terre.** [The storage of Potatoes.]—*La Vie Agric. et Rurale*, xxix, 42, pp. 243–248, 4 figs., 1926.

Full directions are given for the storage of potatoes under various conditions, with special reference to the avoidance of the rotting of the tubers caused by *Phytophthora infestans*. The temperature of the cellar or other place of storage should not exceed 6°

to 8° C., the optimum being from 2° to 4°, with a humidity of 60 to 70 per cent. The different methods of storage are briefly described and compared, and instructions are given for the treatment of tubers stored in pits with lime (5 to 10 kg. per 1,000 kg. of potatoes), sulphur (1 kg. per 1,000 kg.), Bordeaux mixture, or 1 to 2 per cent. sulphuric acid.

TEODORO (N. G.). **Rubber tree diseases and their control.**—*Philipp. Agric. Rev.*, xix, 1, pp. 63–73, 1926.

The symptoms, etiology, and control of a number of the common fungus diseases of *Hevea* rubber (including some not yet known to occur in the Philippine islands) are briefly described.

BOEDIJN (K. B.). **Die spinnewebschimmels van Hevea brasiliensis.** [The cobweb fungi of *Hevea brasiliensis.*]—*Arch. voor Rubbercult. Nederl.-Indië*, x, 8, pp. 369–376, 1 fig., 1926. [English translation.]

Three species of thread blights [*R.A.M.*, iv, p. 66] are stated to occur on rubber (*Hevea brasiliensis*) trees in Sumatra.

The first, and most common, forms thick, strong, white, much ramified strands along the branches and twigs, and over the veins and margins of the leaves. The numerous hyphae composing these strands are generally thick-walled and measure about 3 μ in width. Although the hyphae do not penetrate the tissues, the causal organism may destroy the leaves and branches. The perfect stage of the fungus has not been discovered, but it is conjectured that primary infection is caused by the scattering of diseased twigs and leaves by the wind.

The second kind of thread blight is readily distinguishable by its much finer structure and by the cobweb-like tissue enveloping the branches and the under surface of the leaves. The strands are composed of two kinds of hyphae, namely, a smooth, thick-walled type, measuring about 4 μ in thickness; and thinner hyphae, approximately 2 μ in width, which bear numerous short protuberances. The most conspicuous feature of this second type of mycelium is the occurrence of masses of yellowish-brown cells, furnished with protuberances and known as anchor [termed by Petch (loc. cit.) anker] cells, in association with certain parts of the hyphae. These cells are joined to the hyphae by one of the long protuberances, the connexion, however, only being clearly discernible in young material. The cell body measures about 6 to 10 μ, while the protuberances are from 4 and 22 μ long by 1·5 and 6 μ broad. The writer believes that these so-called anchor cells represent chlamydospores.

The damage caused by this species is similar to that described under the foregoing.

The third, so-called white stem blight, recorded from the east coast of Sumatra and Ceylon [ibid., iv, p. 68], forms large, irregular, whitish or pale pink patches, often exceeding one metre in length and somewhat resembling those due to *Corticium salmonicolor*, on stems and branches. The white stem blight, however, does not cause any discoloration or decay of the underlying bark, while the thin, silky film characteristic of pink disease is also absent. The hyphae

of white stem blight closely resemble those of the first species mentioned above, having thick walls and usually measuring 3 to 4 μ in diameter: they are also branched and may show local protuberances, 5 to 8 μ in width. No exact data are available as to the damage caused by this fungus in Sumatra, while the mode of infection is also obscure.

The sporadic occurrence of the thread blights generally renders control measures superfluous, but the application of 3 per cent. izal or 5 per cent. carbolineum may be advisable in severe cases.

[The English translation of this paper also appeared in *Trop. Agriculturist*, lxvii, p. 240, 1926.]

ASHPLANT (H.). **Rubber in South India.**—*Bull. Rubber Growers' Assoc.*, viii, 9, pp. 463–477, 1926.

The results of a series of spraying experiments carried out during May, 1926, against secondary leaf fall of rubber (*Phytophthora*) [*meadii*: *R.A.M.*, v, p. 691] showed that, of eleven sprays, each tested in a separate plot, only Burgundy mixture (5 lb. copper sulphate and 6¼ lb. sodium carbonate in 50 galls. water) and Bordeaux mixture plus magnesium sulphate (2 lb. copper sulphate, 4 lb. lime, and 2 lb. magnesium sulphate in 50 galls. water) proved effective. Three plots were treated with Bordeaux mixture plus a resin-soda adhesive at half and full strength without appreciable result. Even allowing for the higher cost of Burgundy mixture (estimated at about Rs. 2 per acre), its superiority over Bordeaux in absence of grit (which causes stoppages in the machines) and general efficacy are thought to entitle it to extensive trials.

The results of preliminary experiments in the control of secondary leaf fall by the application to the soil of synthetic urea are regarded as extremely promising, the trees in the treated plots developing 25 to 60 per cent. more foliage than unmanured individuals. The cost of this treatment is estimated at Rs. 50 for 2 cwt. urea per acre, an outlay which is considered well worth while, since the beneficial and revitalizing effect of the treatment is beyond question. At the final inspection of the manured area it was evident that 70 per cent. of the unsprayed trees had lost little or no foliage. Satisfactory results were also given by the application, in February, 1926, of sodium nitrate and ammonium sulphate at the rate of 2 and 3 lb. per tree to two blocks which had received the same substances at the rate of 3 and 4 lb. in December, 1924. The trees in the manured blocks are calculated to bear 30 to 60 per cent. more foliage than those in the untreated. The necessity for large doses of these manures (3 to 6 cwt. per acre) is apparent.

The present models of the Armada spray gun [*R.A.M.*, v, p. 630] have proved somewhat unwieldy when fitted with extensions, and it is proposed to make future models 12 ft. long, all in one piece.

HARDY (F.). **The rôle of aluminium in soil infertility and toxicity. A review.**—*Journ. Agric. Sci.*, xvi, 4, pp. 616–631, 1926.

A detailed summary of the literature on the rôle of aluminium in soil infertility is given.

Aluminium appears to exert a true toxic effect only when pre-

sented to plant roots as simple ions or as the more soluble colloidal electrolytes. These occur in the soil solution only when the reaction is appreciably acid or alkaline, but the nature and concentration of additional ionic matter present in the solution or system affects the limits of P_H values within which the alumina is present in an insoluble or other non-toxic form. There is evidence, however, that even the non-toxic forms of aluminium may apparently accumulate under certain conditions at definite regions of plants, and may disturb their metabolic processes, predisposing the plants to certain diseases [e. g., root rots of maize and sugar-cane: *R.A.M.*, iii, p. 32; v, pp. 326, 762].

HÜLSEMANN. **Der Einfluss des Kalis auf Krankheitserscheinungen der Kulturpflanzen.** [The action of potash on the manifestations of disease in cultivated plants.]—*Ernährung der Pflanze*, xxii, 18, pp. 217–219, 1926.

This is an abstract of a paper by S. Hori on the action of potash on cultivated plants affected by various pathological conditions.

A disease of pears characterized by the slimy, rough, and porous quality of the flesh, which is also partially riddled with holes of varying size and quite inedible, was shown by experiments in the Wakayama Prefecture (Japan) to be due to the absence of potash from the fertilizer.

Dry speck disease of taro [*Colocasia antiquorum*], caused by *Cladosporium colocasiae* and involving wilting of the foliage and death of the roots, was found to be promoted by the excessive use of nitrogenous and phosphatic manures. It was shown that taro requires about five times as much potash as phosphoric acid.

Amorphophallus konjac was also cured of a pathological condition by the protracted application (over a period of five to six years) of wood ash.

The incidence of a wilt of tobacco leaves known as 'standing wither', was reduced from 34 to 16 per cent. by the use of potassium sulphate at Ota in 1922.

CURZI (M.). **Sulla comparsa della Peronospora del Luppolo in Italia e sui nomi generici Peronoplasmopara e Pseudoperonospora.** [On the appearance of *Peronospora* of Hops in Italy and on the generic names *Peronoplasmopara* and *Pseudoperonospora*.]—*Riv. Pat. Veg.*, xvi, 9–10, pp. 229–234, 1926.

The downy mildew of hops (*Pseudoperonospora humuli*) was observed for the first time in Italy at Cannara (Perugia) in July, 1926, in a three-year-old plantation. Small yellowish and brown spots were seen on the leaves, and these bore abundant conidiophores and conidia on the under surface. Oospores were numerous in the palisade tissues of the leaves.

A brief historical survey is given of the distribution of the disease, and it is noted that it was observed for the first time in England in 1920 on seedlings raised from seed of wild hops coming from Italy [*R.A.M.*, iii, p. 62], a fact which suggests the possible previous existence of this fungus on wild hops and allied hosts in Europe, although its spread to cultivated varieties has only recently been noticed.

With reference to the suggestion that *P. humuli* may be only a strain of *P. urticae* which has become adapted to the hop [a suggestion that has not been confirmed by recent work: *R.A.M.*, v, p. 639], the author draws attention to the resemblance of the hemp [*Cannabis sativa*] downy mildew (*P. cannabina*) to the species under discussion, although they are distinct in regard to the size of their reproductive organs and are clearly specifically different, even if it is admitted that possibly one has been derived from the other by adaptation.

In a discussion of the nomenclature of the genus, the name *Pseudoperonospora* is considered to be more correct under the international rules than *Peronoplasmopara* (a name still used by several authors). To the species *P. cubensis*, *P. celtidis*, *P. erodii*, *P. humuli* [and *P. urticae*] already named under the former genus, the author adds the two species described as *Peronoplasmopara cannabina* (Ott.) Peglion and *P. portoricensis* Lamkey.

RAGUNATHAN (C.). **Bacterial leaf spot of Betel.**—*Ceylon Dept. of Agric. Leaflet* 39, 1 p., 2 figs., 1926.

Bacterial leaf spot of betel [*Piper betle*], which was apparently first recorded in Ceylon in 1896, is stated to have caused considerable damage to low-country cultivations since 1921.

The first symptom of the disease, which is usually most prevalent during the monsoons, is the development of minute, water-soaked spots between the veins on the under surfaces of the leaves. Later the spots become visible on the upper surfaces as dark, rounded or angular areas, surrounded by yellow zones. The centres of the spots are mottled brown, later turning black and rotting. In the early stages of infection the individual spots measure up to one-fifth of an inch in diameter; subsequently they merge into large, irregular, dead areas. Sometimes the central dead tissues of old spots fall out, and on badly infected vines the diseased leaves turn yellow and fall. Under damp conditions a gummy substance, swarming with bacteria, exudes from the under surfaces of affected leaves. The stem may also be attacked, and in severe cases the vines may die.

A bacterium was found in all freshly diseased leaves and its pathogenicity proved by a series of inoculation experiments. The organism has been named *Bacterium betle* n. sp. [without diagnosis or description]. Infection was found invariably to occur through the stomata on the under surface of the leaf.

Control measures should include the immediate destruction of all diseased material; six months' crop rotation with vegetables; and attention to general sanitation. The application of poisonous sprays is not advocated, since the leaves are used for chewing.

[This paper is reprinted in *Trop. Agriculturist*, lxvii, 4, pp. 742–3, 1926.]

VAN BREEMEN (P. J.). **Eenige waarnemingen omtrent het zwermen van Aphis maidis Fitch.** [Some observations on the swarming of *Aphis maidis* Fitch.]—*Meded. Proefstat. Java Suikerind.* 18, pp. 513–543, 3 graphs, 1926.

In connexion with an inquiry into the association between the

swarming of *Aphis maidis* and the occurrence of mosaic on sugar-cane in Java [*R.A.M.*, iv, p. 244], the writer describes the application of a method of estimating the relative abundance of various insects at different seasons. The specially constructed traps were found to contain the largest numbers of *A. maidis* during the latter part of December and the first half of January, 1924–5, while in 1925–6, the maximum was not reached till early in February. In both cases the swarms followed the first heavy rains of the west monsoon. *A. sacchari* occurred more or less uniformly from December to May, 1924–5, and from November to May, 1925–6. *A. gossypii* was prevalent in June, 1925, but in no case was this insect observed on sugar-cane.

Results of Cane selection in Porto Rico.—*Facts about Sugar*, xxi, 40, p. 950, 1926.

According to C. E. Chardon, Commissioner of Agriculture for Porto Rico, the planting of improved mosaic-resistant varieties of sugar-cane added roughly $13,000,000 to the value of the 1926 crop, the increase of which over the ten-year average (1915 to 1924) was 162,948 tons or 37·03 per cent. Taking the crops of 1925 and 1926 together, the corresponding increase over the earlier period is 191,329 tons or 43·42 per cent. It is estimated that between 1918 and 1925, three-fourths of the sugar-cane acreage in Porto Rico was changed to the newly selected varieties.

Goseco (A. P.). **The transmission of Fiji disease of the Sugar Cane.**—*Sugar Centr. and Planters' News*, vii, 10, pp. 736–739, 3 figs., 1926.

An experiment was undertaken to ascertain the mode of transmission of Fiji disease of sugar-cane [*Northiella sacchari*: *R.A.M.*, iii, p. 606], which is stated to be rapidly gaining ground in the Philippines, especially on the Hawaii 109, Java 247, Hawaii 227, and Luzon White varieties.

Ordinary old cane field soil was heated for twenty minutes at a temperature of 80° C. and placed in nine cans in groups of three. The soil in one group (B) was infected with crushed leaves of H. 109 cane showing severe symptoms of Fiji disease. In each of the cans in this group two healthy H. 109 points were planted. The cans in group A were planted with points from diseased stalks, and those in group C with points from healthy canes.

The results of weekly measurements and observations [which are presented in tabular form] showed that the points from diseased stalks in group A have infected shoots even in sterilized soil, while the healthy setts planted in soil infected with diseased leaves in group B produced sound canes, as did also those planted in healthy soil in group C: the growth in the first group was much slower than that of groups B and C, the average weekly increase after 11 weeks being 7·4, 8·1, and 8·0 inches, respectively.

North (D. S.). **Leaf-scald; a bacterial disease of Sugar-cane.**—*Colonial Sugar Refining Co.*, [Sydney, New South Wales,] *Agric. Rept.* 8 (Technical), 80 pp., 2 col. pl., 25 figs., 1926.

Leaf scald in Australia and Fiji appears to be identical with the

'gomziekte' of Java as described by Wilbrink (*Arch. Suikerindus. Ned.-Indië*, xxviii, pp. 1399–1525, 1920) and also with a similar disease in the Philippines [*R.A.M.*, iii, p. 302; iv, p. 242]. It was probably prevalent in Queensland and Fiji from 1900 onwards but was not recorded definitely until 1911. It is now general throughout the cane areas of Queensland and New South Wales and in two localities in Fiji. No known varieties are immune: among those which have been extensively cultivated, Mahona has shown itself everywhere to be highly susceptible, N.G. 16 and Goru to be moderately resistant, and Malabar and D 1135 highly resistant. Badila is highly resistant except in northern Queensland, where its resistance is only moderate.

Leaf scald is a bacterial disease of the vascular system resembling Cobb's gumming disease (*Bacterium vascularum*), from which it differs by the absence of a yellow slime in the vessels of the xylem, by the characters of the pathogen, and in the field symptoms. Two distinct phases of the disease have been recognized, an acute and a chronic form, which may occur independently or the one may grade into the other. The disease is usually present in a crop for a long time in the chronic form before the acute wilt appears. The latter shows itself as a more or less abrupt withering of the foliage and desiccation of the stalks, and occurs typically in New South Wales in one- and two-year-old crops approaching maturity in spring or early summer during and following a period of dry weather. The wilting canes show, as a rule, no other definite symptoms either external or internal, but search at the base of the stools will reveal, usually, one or more small, diseased shoots, displaying the critical leaf markings of the chronic form, and these symptoms appear also on the ratoon shoots after harvesting.

In the chronic form of the disease straight, narrow, well-defined, longitudinal, whitish streaks, up to an eighth of an inch in width and overlying one or a group of vascular bundles, are present on the leaf blades and sheaths; they may extend through the whole length of the blade or die out before reaching the tip. The streaks are plainly visible as soon as the young leaf unfolds and turns green, and may even be detected on the white and immature leaves unfolded by hand. On the older leaves the streaks tend to broaden and become more diffused, and they may include fine red streaks and spots; the broadening usually begins at the tip of the leaves and works downwards, being accompanied by a progressive withering of the affected tissues which is most pronounced in dry weather. Numerous side shoots and small suckers are also produced, and white chlorotic leaves appear in advanced stages. Both stalks and leaves are stunted, the latter being stiff and tending to curl upwards. Reddened vascular bundles occur in the stems, particularly at the nodes, and dried-up cavities may be found in advanced stages. The leaf streaks and reddened bundles of the stem are invaded by bacteria, which are usually confined to the xylem vessels. The roots of affected stools appear to be normal, but the root development from infected cuttings is largely suppressed and the weak roots which do push out soon die.

The pathogen [which is not named] was found difficult to isolate and cultivate; but good results were obtained by an addition of

10 per cent. bullock's-blood serum (sterilized by ether) to sterilized sucrose potato agar (testing +15 to +20 Fuller's scale) or 25 per cent. cane-juice peptone agar. On those media, at 25° C., isolated colonies show up after seven or eight days when inoculations are made from leaf streaks or reddened vascular bundles in the stem. On potato agar the colonies (which may attain a diameter of 2 mm.) are entire. They are wet-shining, convex, and light buff-yellow by transmitted light; on potato blocks the growth, if any occurs, is creamy-yellow. In litmus milk there is a slow increase of alkalinity, reduction of the litmus starting from the bottom of the tube, and a gradual clearing after several months. In the cane the organism is present as a straight, slender, motile rod, about 1·0 by 0·2 μ in diameter, this being less than half the width of the rods of *Bact. vascularum*. On artificial media long, twisted threads and curved forms developed frequently.

Typical symptoms of leaf scald resulted from inoculations with pure cultures on the ends of cuttings before planting and from injections of suspensions into the embryonic leaves or stem tissues near the growing point of shoots. Inoculations into mature leaf-blades, leaf-sheaths, mature stem tissues, and roots gave negative results.

Dissemination of the disease takes place in the field practice (1) by the use of infected planting material, (2) by knife infection, and (3) by some other unknown agency, probably an insect vector. Planting trials indicated that the disease may be transmitted by the dormant side-buds, while the sudden wilting of stools in 'ring-worm' patches seemed to suggest transmission by root contact. No evidence of infection from the soil nor from any other source than diseased cane could be observed.

Control of the disease may be effected readily by the use of highly resistant varieties. If the variety in cultivation is susceptible, such as Mahona, stringent precautions are necessary to secure healthy plants, owing to the fact that canes of healthy appearance may harbour the disease in a latent condition. No cuttings should be taken from fields showing evidence of infection, however slight, and none from fields within a quarter of a mile of diseased cane. If the variety grown is moderately resistant, like N.G. 16, less rigid precautions may be effective, as the infection spreads more slowly. On the other hand more stalks of such varieties harbour the disease in the latent condition and are dangerous as hidden carriers when introduced into localities where healthy but susceptible kinds are being grown.

KELLY (N. L.). **Bureau of Sugar Experiment Stations. Assistant Pathologist's Reports.**—*Australian Sugar Journ.*, xviii, 6, pp. 350–352, 1926.

Leaf stripe of sugar-cane [*Sclerospora sacchari*: *R.A.M.*, v, p. 327; vi, p. 54] is stated to be very prevalent in the Lower Burdekin area of Queensland wherever the B. 208 variety is widely grown. Only in one badly infected field was the disease found to have spread to the H.Q. 426 variety, showing that secondary infection is not of very rapid occurrence. In the Airdale, Maidavale, and Klondyke districts the disease is also widespread on B. 208.

ZAPROMETOFF (N. G.). Материалы по микофлоре Средней Азии. Выпуск 1-ый. [Materials for the mycoflora of Middle Asia. Part 1.]—Pamphlet of the *Uzbekistan Plant Protection Exper. Stat., Phytopath. Sect.*, Tashkent, 36 pp., 2 figs., 1926.

The present list contains 369 species of fungi, for the most part parasites, recorded in the little-known region of Middle Asia [see also *R.A.M.*, v, p. 174]. Among the numerous interesting records the following may be mentioned.

Urophlyctis trifolii on *Trifolium repens*. *Pythium de Baryanum* on tobacco. *Sclerospora graminicola* on *Setaria* sp. Fifteen species of *Peronospora*. Forty-five species and varieties of Erysiphaceae, including *Podosphaera leucotricha* on the apple; *P. oxyacanthae* on the quince; *Sphaerotheca humuli* on hops; *S. mors-uvae* on the gooseberry; *S. pannosa* f. *persicae* on the peach and almond; *Erysiphe communis* [*E. polygoni*] f. *solanacearum* in its conidial stage ('*Oidium lycopersicum*') on the leaves of tomato; *Microsphaera quercina* on *Quercus* sp.; *Uncinula mori* on white mulberry (*Morus alba*). Other Ascomycetes include *Rosellinia necatrix* causing a root rot of nursery trees of *Pistacia vera* and *Salix* sp.; *Neocosmospora vasinfecta* and *Fusarium vasinfectum* on cotton seedlings [*R.A.M.*, v, p. 175]; *N. vasinfecta* var. *sesami* Jacz. and *F. vasinfectum* var. *sesami* Jacz. on *Sesamum orientale* (the conidial fungi in both cases being regarded as stages of the *Neocosmospora*). Among the 29 smuts listed are *Ustilago reiliana* [*Sorosporium reilianum*], *U. sorghi* [*Sphacelotheca sorghi*], and *Tolyposporium ehrenbergii* on sorghum (*Andropogon sorghum*); *Ustilago levis* on oats; *U. passerinii* on *Triticum cylindricum*; *U. turcomanica* on *T. squarrosum*; *U. vavilovi* Jacz. on rye (Jaczewski's description [*R.A.M.*, v, pp. 174, 733] being quoted: the fungus causes symptoms similar to those of loose smut of wheat, but the apical portion of the ear often remains sound, and the affected portion is somewhat harder to the touch; the chlamydospores are round, of a uniform brownish colour, almost entirely smooth or bearing very few and hardly distinguishable spines, and 4·6 to 6·4 μ in diameter); *Tilletia levis* and *T. tritici* on wheat. One hundred and nine rusts are enumerated. The ten species of Basidiomycetes listed include *Endobasidium clandestinum* on grapes (a fungus first described by N. Speschnew in 'Fungal parasites of the Transcaspian region and Turkestan', 1901). The Fungi Imperfecti are represented by 122 species, including *Phoma jaczevskii* Spesch. and *P. reniformis* Viala on grapes; *Ascochyta caulicola* on *Medicago sativa*; *Septoria agrestis* on *Agropyron intermedium* and wheat; *S. datisca* A. Bond. n. sp. on *Datisca cannabina* (causing heavy infection of the leaves, on the under side of which appear numerous minute, brownish black pycnidia, 108 μ high and 81 μ broad, containing hyaline, slightly falcate spores, 32 to 43 by 2 to 3 μ in diameter); *S. lycopersici* on tomato; *S. tritici* on wheat; *Entomosporium maculatum* on *Pyrus communis*; *E. mespili* on *Cotoneaster multiflora*; *Gloeosporium morianum* on the under side of the leaves of *Medicago sativa*; *Monilia pistaciae* Zaprometoff n. sp. (causing a rot of pistachio nuts, which are covered by dark coloured, oblong spots, bearing greyish pustules formed by the conidial fructifications of the fungus: these are

composed of chains of hyaline, ellipsoidal conidia, 5 to 7 by 3·5 μ in diameter); *Ramularia carthami* Zaprometoff n. sp. on the leaves of *Carthamus tinctorius* (causing brown leaf spots, 3 to 6 mm. in diameter, occasionally irregular and up to 8 mm. in diameter, with a white efflorescence on the under side, composed of dense tufts of hyaline, unbranched conidiophores, 14 to 25 by 3·5 μ in diameter, the conidia being hyaline, cylindrical with rounded apices, one- or two-celled, rarely three-celled, and 14 to 25 by 3·5 to 4·5 μ in diameter); *Fusicladium sorghi* on *Panicum miliaceum* and *Andropogon halepensis*; *Cercospora roesleri* Sacc. (syn. *C. fuckelii* Jacz.), *C. vitiphylla* Barb. (syn. *Coryneum vitiphyllum* Speschnew, *C. roesleri* f. *vitiphylla* Elenk.) and *C. vitis* Sacc. on the vine.

BLUMER (S.). **Variationsstatistische Untersuchungen an Erysiphaceen.** [Investigations on the statistics of variation in the Erysiphaceae.]—*Ann. Mycol.*, xxiv, 3–4, pp. 179–193, 1 graph, 1 diag., 1926.

By biometrical methods [the principles and application of which are explained] the writer conducted a series of tests to determine the constancy and systematic significance of the perithecial and conidial dimensions of the 'collective species' *Erysiphe polygoni* on various hosts [*R.A.M.*, iv, pp. 315, 431].

The strain on *Acacia catechu* from India was shown to differ from all others in its very large perithecia, a character which the author regards as sufficiently distinctive to justify its determination as a distinct species, which he names *E. acaciae*, within the *polygoni* section. The remaining forms examined constituted a graduated series according to their perithecial dimensions. In general, the strains occurring on the Ranunculaceae were found to be smaller than those on Papilionaceae, Umbelliferae, and Cruciferae.

Both the collective species *E. polygoni* and *E. cichoracearum* comprise several well-defined strains or subspecies ('Kleine Arten') distinguishable by variations in the conidial dimensions. These variations, however, are not constant on the same host (possibly because more than one strain is present) and the same dimensions may also fit several different species of mildews. Conidial dimensions, therefore, may be used to a certain extent as a differential character for subspecies within a collective species, but not for the latter themselves. It is considered impossible to refer an *Oidium* of unknown systematic position to a particular species on the basis of its conidial measurements.

ŠKORIĆ (V.). **Erysiphaceae Croatiae. Prilog fitopatološko-sistematskoj monografiji naših pepelnica.** [Erysiphaceae Croatiae. Contribution to a phytopathologic-systematic monograph of our powdery mildews.]—*Annales pro Experimentis Foresticis*, Zagreb, i, pp. 52–118, 32 pl., 1926. [English summary.]

The present paper gives an outline of the morphology, biology, and affinities of Erysiphaceae, and also an account of their economic importance and of the means for their control. A systematic list is given of 30 species, belonging to seven genera, which have been so

far recorded in Croatia, Jugo-Slavia, together with diagnoses in the Croatian language, synonyms, and an enumeration of the hosts. One species is regarded as new. It was only found in the conidial stage, on flax (*Linum usitatissimum*), in the neighbourhood of Zagreb, and is named *Oidium lini*, a Latin diagnosis being given.

Cross-inoculation experiments showed that *Sphaerotheca pannosa* from the rose does not infect the peach; *Podosphaera oxyacanthae* from *Crataegus oxyacantha* cannot infect the quince (*Cydonia vulgaris*) and vice versa; *Microsphaera alphitoides* [*M. quercina*] from the oak infects the beech and vice versa; and *Podosphaera leucotricha* from the apple can infect the pear. It was found that the mycelium of *M. alni* hibernates in the buds of *Rhamnus cathartica*. *M. quercina* grown on young oaks in the laboratory produced perithecia indistinguishable from those that are found in nature. The optimum temperature for conidial germination in this fungus is 26° to 28° C. *Podosphaera oxyacanthae* inoculated into the buds of *Crataegus* almost entirely inhibited the process of differentiation of the cellular tissue of the shoots and thus caused the rapid withering of the latter. Experiments with *Sphaerotheca pannosa* confirmed Vaviloff's statement that the *Lutea* and Tea varieties of roses are the most resistant, and the *Remontanta* varieties the most susceptible to this fungus, while Tea hybrids were partly resistant and partly susceptible. A number of new hosts of different species are listed.

A bibliography of 110 titles is appended.

BURT (E. A.). **The Thelephoraceae of North America. XV.**— *Ann. Missouri Bot. Gard.*, xiii, 3, pp. 173–354, 3 figs., 1926.

This is the final number of a series of papers by the author dealing with the North American Thelephoraceae; the present number treats in detail the genus *Corticium* (108 spp.), adds a few species to the genera previously dealt with, and closes with a general index to the whole work.

Five of these species of *Corticium* occur in pathological literature. *C. koleroga* (Cooke) v. Höhn. (synon. *Pellicularia koleroga* Cke, *Erysiphe scandens* Ernst) is a parasite of the branches and leaves of coffee; material has been examined and authenticated by the author from Mysore (the type collection), and from Porto Rico, Colombia, and Venezuela. *Corticium stevensii* Burt (= *Hypochnus ochroleucus* Noack apud Sacc. nec *C. ochroleucum* Bresad.) is a parasite of pome fruits in Brazil and southern U.S.A.; and a parasite of *Codiaeum* in Trinidad is passed as this species. *C. vagum* Berk. & Curt. is accepted as the correct name for the perfect form of *Rhizoctonia solani* Kühn, and the following names are given as synonyms: *C. vagum* Berk. & Curt. var. *solani* Burt, *Hypochnus solani* Prill. & Del., *C. solani* Prill. & Del. apud Sacc., and *C. botryosum* Bresad. The spore characters of specimens from living potato, from earth, and from wood on the ground are illustrated. The account of the synonyms of *C. salmonicolor* B. & Br. (= *Necator decretus* Mass., *C. javanicum* Zimmer., *C. zimmermanni* Sacc. & Syd.) as given by Petch is cited and confirmed, and some further hosts added. Finally *Corticium centrifugum*

(Lév.) Bresad. (*Rhizoctonia centrifuga* Lév., *Hypochnus centrifugus* Tul.) is stated to be common on decaying wood and leaves and fallen branches in Europe, and is frequent in Canada and North America, and in the West Indies. This species is not mentioned by the author as a pathogen [see also *R.A.M.*, vi, p. 56].

DEARNESS (J.). **New and noteworthy fungi. IV.**—*Mycologia*, xviii, 5, pp. 236–255, 1926.

This list contains new or noteworthy fungi belonging to the Discomycetes, Pyrenomycetes, and Fungi Imperfecti collected in the United States. One new genus is included, namely *Phragmodothidea*, which differs from *Phragmodothella* Theiss. & Syd. in being paraphysate, and in having more than three septa in the ascospore. The species *Phragmodothidea eucalypti* is recorded on the bark of dead stems of *Eucalyptus* sp. The following parasitic new species and varieties, amongst others, are recorded:—*Pezizella minuta* on needles of *Pinus rigida*, *P. virginiana*, *P. echinata* and *P. taeda*: *Phacidium infestans* Karst. var. *abietis* on leaves of *Abies concolor* and *A. grandis*: *P. abietinellum* on needles of *Abies balsamea*: *P. convexum* on needles of *Pinus rigida*: *P. taxicolum* on leaves of *Taxus canadensis*: *Bifusella abietis* on leaves of *Abies lasiocarpa*: *Hypoderma hedgcockii* and *H. lethale* on leaves of various species of *Pinus*: *Hypodermella laricis* Tub. var. *octospora* on *Larix occidentalis*: *Lophodermium australe* on needles of various species of *Pinus*: *L. laricis* on needles of *Larix lyallii*: *Dimerosporium abietis* on needles of *Abies amabilis* and *A. grandis*: *Meliola pinicola* on needles of *Pinus echinata*: *Dimerium juniperi* on branchlets of *Juniperus occidentalis*: *Hypospila californica* on leaves of *Alnus rhombifolia*: *Oligostroma* (*Phyllachora*) *acicola* on needles of *Pinus palustris*, associated with *Cryptosporium acicolum*: *Dichaena pyri* on bark round the base of dying apple tree: and *Haplosporella amygdalina* on *Amygdalus persica*.

MANEVAL (W. E.). **Parasitic and wood-destroying fungi of Boone County, Missouri.**—*Univ. of Missouri Studies*, i, 1, pp. 65–111, 1926.

The fungi enumerated in this paper were nearly all collected from 1903 onwards by the students and staff of the University of Missouri and by others interested in the work of the Plant Disease Survey of the United States Department of Agriculture. They have been determined by the author with the assistance of several specialists. The list includes 480 species on about 380 hosts, and comprises 27 Phycomycetes, 65 Ascomycetes, 23 Ustilaginaceae, 99 Uredinaceae, 81 Basidiomycetes (mainly wood-destroying species), 159 Fungi Imperfecti, and 18 Bacteria. Notes are given on prevalence, distribution, and, where known, the date of first collection and name of the collector. There are a few bibliographical references. A host index is appended, in which the synonyms for the fungi are included and common names added for the cultivated hosts.

STEVENS (N. E.). **Two species of Physalospora on Citrus and other hosts.**—*Mycologia*, xviii, 5, pp. 206–217, 2 figs., 1926.

A fungus collected from cut branches of citrus and other stems

at Herradura, Cuba, in January 1925, is regarded by the writer as a new species, and named *Physalospora fusca*. It has all the characteristics of this genus, except that the ascospores, when mature, are dark in colour, thus differentiating it from all other known species of *Physalospora*. In single ascospore cultures conidia in pycnidia were produced. These conidia were found to be almost indistinguishable from those of *Diplodia gossypina*, and those of the citrus stem end rot *Diplodia* generally known as *D. natalensis*. The perfect stage of the latter has been shown to be a *Physalospora* allied to *P. malorum* [*P. cydoniae*: *R.A.M.*, iv, p. 667]. The writer points out that *D. natalensis* and its perfect stage have been found on other hosts besides *Citrus*, and that this fungus is apparently identical with *Physalospora rhodina* Berk. & Curt. The *Physalospora* previously reported on *Gossypium* [*R.A.M.*, v, p. 90] under the name *P. gossypina* is apparently also identical with this species. Cultural studies show that *P. fusca* and *P. rhodina*, although very similar in many respects, are yet specifically different. What is regarded as the pycnidial stage of *P. rhodina* has been received by the author from other countries besides the United States (India, Ceylon, the Federated Malay States, Uganda, &c.), on tea, *Hevea* rubber, mango, cacao pods, sweet potato tubers, and other plants, and the possibility that *Diplodia cacaoicola* [*Botryodiplodia theobromae*] is the conidial stage of *P. rhodina* is suggested.

CURZI (M.). **De novis Theae micromycetibus pathogenis.** [New pathogenic microfungi on Tea.]—*Atti Ist. Bot. di Pavia*, Ser. III, iii, pp. 59–65, 2 pl., 1926. [Abs. in *Riv. Pat. Veg.*, xvi, 9-10, pp. 238–239, 1926.]

The following parasitic fungi, which the author describes as new species, were found on tea in the Botanic Gardens, Pavia: *Diaporthe theicola* on branches, *Phomopsis theicola* on branches and leaves, *Phyllosticta theicola*, *Ascochytella theicola*, *Septoria theicola*, and *Ramularia theicola* on leaves. Of these, *Phomopsis theicola* is the most destructive and is possibly a stage of the *Diaporthe*. A comparison with the fungi found on tea in the tea-growing countries has led the author to conclude that the species found at Pavia are European species which have become adapted to an exotic host, and have acquired new specific characters.

T[UNSTALL] (A. C.). **Pruning in relation to disease in the Surma Valley.**—*Quart. Journ. Indian Tea Assoc.*, *1926*, 3, pp. 103–107, 1926.

Directions are given for the pruning of tea bushes in the Surma Valley of north-eastern India, with special reference to the prevention of stem disease due to various wood-destroying fungi [chiefly *Auricularia auricula-judae*, *Nectria cinnabarina*, *Marasmius pulcher*, *Poria hypobrunnea*, and *Corticium* spp.: *R.A.M.*, v, p. 6]. During the drought in the cold weather of 1922, 1923, and 1924, many bushes were killed by these diseases before new growth had been made. Where it is necessary to reduce the height of the bushes, the pruning cuts should be made close to a young stem immediately below the previous year's pruning. All the cuts will then be in the neighbourhood of vigorous growing wood, where

the chances of infection by stem diseases are much slighter. New shoots should not be allowed to grow up to the plucking level, but should be cut back to eight or nine inches in the first year and induced to develop branches to the outside of the bush. The flat plucking system is advocated as tending to develop the sides of the bush and thereby reducing congestion. The treatment of pruning cuts with lime-sulphur [*R.A.M.*, v, p. 194] is recommended. Good results as regards the promotion of the formation of callus have also been obtained with cow-dung paste.

HOFFMANN. **Tabakkrankheiten.** [Tobacco diseases.]—*Prakt. Blätter*, iv, 6, pp. 131–133, 1926.

Serious damage is stated to have occurred in the tobacco plantations of the Palatinate as a result of the sclerotial [*Sclerotinia sclerotiorum*: *R.A.M.*, v, p. 137], 'mauche' and pox diseases, and also from seedling diseases associated with infection by *Thielavia basicola*, *Alternaria tenuis*, and *Fusarium* sp. The symptoms of attack by the sclerotial disease include a curling and discoloration of the leaves, while pox [which is believed to be, like the 'mauche' disease, a physiological disturbance], is characterized by a pale spotting which may lead to the leaves drying up. It has been observed that seedlings planted out at or after the middle of June are most liable to these troubles. The diseases (especially pox) appear to be promoted by sudden alternations in the weather, while an insufficiency of nitrogen or potash also favours attack by fungi. Further investigations on these serious diseases, which are estimated to have caused a loss of at least 50 per cent. near Speyer, are regarded as highly necessary.

Gesetze und Verordnungen. Oesterreich. [Laws and regulations. Austria.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 10, p. 86, 1926.

The Federal Decree of 28th July, 1926 (published in No. 44 of the *Bundesgesetz-blatt*, 1926), requires that all potato consignments (except samples of seed) imported into Austria be accompanied by certificates of origin and health, dated not more than three days prior to the day of delivery.

The Protection from Plant Disease (Banana Trash) Order 1926. —*Journ. Jamaica Agric. Soc.*, xxx, 10, pp. 434–435, 1926.

The Banana Trash Order 1925, issued under the Plant Disease Law 10 of 1925 [*R.A.M.*, v, p. 63], is revoked, and a new Protection from Plant Disease (Banana Trash) Order 1926 is substituted. Under this Order the use of banana trash or banana leaves for the purpose of packing or wrapping anything for transport on public roads or railways in Jamaica is prohibited, except when they are used for wrapping or packing bananas for transport to a licensed buying station for export. At the buying station all such débris must be burnt within 24 hours, none being removed from the station.

This Order is intended for the prevention of dissemination of the Panama disease (*Fusarium cubense*) and black weevil borer [*Cosmopolites sordidus*] of bananas.

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MOORE (ENID S.). **Diseases of Virginian Tobacco in South Africa.**—*Journ. Dept. Agric. S. Africa*, xii, 5, pp. 428–455, 25 figs., 1926.

In the present paper, the principal fungous, bacterial, and physiological diseases affecting the Virginian tobacco crop in South Africa are enumerated and briefly described, directions for control being given in every case. Many of the statements presented are based on records and investigations made in other countries, especially in the United States, but experience has shown that in the main these hold true for South Africa also.

Damping-off, associated with *Pythium*, *Rhizoctonia*, *Fusarium*, and *Phoma*, occurs in the seed-beds, especially in hollows where the ground is moist. Excessive watering and bad ventilation favour the rapid spread of this trouble.

Wilt caused by *Fusarium oxysporum* var. *nicotianae* has been reported at intervals from different districts, and was especially prevalent during the 1925–6 season. Serious damage appears to have been done by it as long as twenty years ago in the Kat River Valley, and wilt is evidently firmly established in this area. Three types of the disease have been observed: in the first, all the leaves may droop, turn yellow (without spotting), and die within a few days, indicating a complete stoppage of the water supply, accompanied by toxic effects; in the second, only the leaves on one side are affected, the other side remaining normal and healthy, a condition which accompanies the invasion of a single lateral root; and in the third, which may develop even in the seed-bed, there is a stunted development of the plant and the leaves are small, crumpled, misshapen, spotted, and clustered into a rosette. This last type appears to be peculiar to the Kat River Valley; the affected plants have a stout main root, but a normal growth of healthy laterals is conspicuously lacking. It is probably due to

infection of the rootlets in the seed-bed or at the time of transplanting. As in America, the wilt disease thrives best at high temperatures. For its control, it is recommended to choose new ground for the seed-bed, and to sterilize the soil by burning; also to practise a long rotation, selecting one which reduces nematodes. If the disease appears, affected plants should be pulled out and destroyed. In the western Transvaal the Joiner variety appears to be much more resistant to this disease than Sterling or Groot Swazie.

Wildfire (*Bacterium tabacum*) has caused considerable damage to both Turkish and Virginian tobacco in South Africa. In discussing the means of spreading the disease, and the resulting control measures, the author refers to the absence of the wildfire organism on any plant other than tobacco in the vicinity of the infected seed-beds and fields, so far as a close search has indicated. The importance of controlling wildfire in the seed-bed is emphasized. Attention is drawn to the advisability of soil sterilization by burning and seed disinfection, using the weak formalin solution previously recommended [*R.A.M.*, v, p. 58]. Spraying with 4–4–50 Bordeaux mixture (to which 3 oz. lead arsenate per 4 galls. spray may be added) has been found effectively to protect seed-beds from infection, without causing any injury to the plant. Bordeaux dusts have been tested on a small scale, but at present seem hardly to offer any advantage over the old-established spray treatment. Actual field precautions are of doubtful value when once the disease becomes established after transplanting. Attention is drawn to the importance of destroying all tobacco waste as long as possible before the next season's seed-beds are prepared, and all field refuse should be ploughed in soon after the harvest. In areas of summer rainfall, a spell of wet weather late in the season may ruin the crop, whilst dry weather may enable younger plants, even though diseased, to mature and give a good return.

Angular leaf spot (*Bact. angulatum*) appears in the seed-bed and in the field, and the causal organism lives and spreads in much the same way as wildfire, differing, however, in the appearance of the leaf spots it produces. The same preventive measures are applicable to both diseases.

White rust (*Oidium*) [? *Erysiphe cichoracearum*] is of common occurrence, giving the leaf a greyish-white appearance, sometimes in patches and sometimes over the entire leaf. Damp weather or excessive irrigation encourages the spread of the disease, which develops usually on the lower, shaded leaves. Control measures are at present limited to avoiding the conditions which favour its growth (lack of ventilation through overcrowding, and the like).

Red rust (*Macrosporium longipes*) is also frequently observed. The spots in this disease are distinguished from those of wildfire by their thicker, rougher texture and rusty colour. White speck (*M. tabacinum*) may be recognized by the pale brown spots, which are scattered or separate at first and then merge to form bleached or scorched patches between the larger veins, on the lower and middle leaves. No control measures have yet been suggested for either of these two diseases.

Diseases, the cause of which have not yet been discovered, include

various leaf spots, curly leaf, and splitting of the leaf between the veins. Mosaic is found wherever the crop is cultivated.

Nicotiana rustica is affected by a wilt caused by *Sclerotium rolfsii* and is also probably susceptible to the *Fusarium* wilt described above.

PALM (B. T.). **Verslag van het Deli Proefstation over 1 Januari 1925–31 December 1925.** [Report of the Deli Experiment Station from 1st January 1925 to 31st December 1925.]— *Meded. Deli Proefstat. Medan-Sumatra,* Ser. 2, xlii, 35 pp., 1926.

This report contains the following references of phytopathological interest. In connexion with the investigations on slime disease of tobacco [*Bacterium solanacearum*: *R.A.M.*, iv, p. 637], it was ascertained that a distinct correlation exists between the degree of soil moisture and the incidence of infection, the latter reaching its maximum at saturation point. In red hill soils the causal organism is unable to exist where the soil moisture is below 7 to 8 per cent., and extensive areas have been freed from infection by drying the soil in the shade, tomato plants being used as indicators of disease.

The discovery that the bacteria may penetrate as deeply as 1 metre into the soil largely explains the failure of all attempts to destroy them by heat or chemical disinfection. The chance of developing a practical and economical method of soil disinfection is regarded as very slight.

New host plants of *Bact. solanacearum* discovered during 1925 include *Phytolacca octandra*, *Sesbania grandiflora*, and *Ruellia tuberosa*.

Selections from the progeny of the slime-resistant tobacco strains R 12, R 112, R 518, and R 72 were tested on three estates. Considerable resistance was shown, but the quality of the tobacco leaves much to be desired, especially in the case of R 518, which is also highly susceptible to the obscure, apparently non-parasitic disease known as red rust, which caused considerable damage on five estates.

An experiment was undertaken to test the resistance of five Java selections of groundnut (*Arachis*) [*hypogaea*] to slime disease on infected soil at Deli. Selections 15·4, Z.L. 21, and 16·3 remained perfectly healthy, while W.B. and Deli var. showed only a trace of infection (0·3 and 0·9 per cent., respectively) [see also *R.A.M.*, iv, p. 594]. In a similar test on the Karo plateau all varieties were reported to be destroyed by the disease. In the former experiment, the tobacco showed 81·5 per cent. infection and the green and red varieties of *Hibiscus cannabinus* 62·4 and 26·5 per cent., respectively.

A distinct strain of the *Rhizoctonia* found on tobacco [*R.A.M.*, vi, p. 4] occurred in seed-beds of *Ochroma lagopoides*.

Crotalaria toxicaria in tobacco seed-beds was severely attacked by *Pythium de Baryanum*.

A disease of undetermined origin, known as 'black heart', was reported from one tobacco plantation. The youngest leaves and sometimes the top of the stem turned partially or wholly black. In mild cases normal growth was later resumed, but in others a

lateral branch from the axil of one of the lower leaves assumed the functions of the main stem.

VALLEAU (W. D.) & JOHNSON (E. M.). **The relation of nitrates to Tobacco frenching.**—*Science*, N.S., lxiv, 1655, pp. 278–279, 1926.

During the winter of 1925–6, the phenomenon known as frenching [*R.A.M.*, iv, p. 467] occurred on Turkish tobacco plants growing in highly organic soil at the Kentucky Agricultural Experiment Station. The results of experiments in the production and control of the disease under greenhouse conditions suggest that frenching occurs when the rate of carbohydrate metabolism proceeds relatively more rapidly than nitrogen absorption. In the absence of sufficient available nitrogen, the leaf tissue cannot develop chlorophyll and other necessary cell constituents as fast as they are required for the production of a normal green leaf.

The marked similarity between the symptoms of apple and pecan rosette [ibid., iii, p. 341; v, p. 507] and tobacco frenching suggests that a common cause, namely, deficiency of available nitrogen, is at the root of all three disturbances. This view is supported by the rapid recovery of frenched plants on the addition of nitrates to the soil, and by that of affected pecan and apple trees by the ploughing under of organic matter, especially legumes.

JATZYNINA (Mme K.). О болезнях Томатов. [On Tomato diseases.] —*Сад и Огород* [*Garden and Kitchen Garden*], Moscow, lxvi, 4–5, pp. 97–102, 1926.

According to the observations of the Moscow Plant Protection Station, the principal diseases of the tomato in the central provinces of Russia are leaf spot (*Septoria lycopersici*); fruit spot (*Macrosporium lycopersici*), which occasionally also heavily attacks the leaves; fruit rot caused by *Phytophthora infestans* [*R.A.M.*, v, p. 703]; and bacteriosis of the fruit [*Bacterium lycopersici*: ibid., v, p. 59]. It was noted that the *Phytophthora* rot of tomato usually appears from 10 to 14 days after the appearance of the disease on the leaves of the potato, and the author is of opinion that infection is carried by spores from the latter to the former.

Experiments were made at the Station in 1925 to test the relative resistance of different varieties of tomato to all four diseases, the indications being that the varieties Mikado and Modern No. 1 are the least susceptible to the pathogenic action of the three species of fungi. Spraying with 1 per cent. Bordeaux mixture considerably reduced the incidence of these diseases and increased the yield of the crop. There were no cases of bacterial rot in 1925, so that no observations could be made in regard to this disease.

S[CHENK] (P. J.). **Tomatenkanker.** [Tomato canker.]—*Floralia*, xlvii, 40, pp. 631–633, 1 fig., 1926.

A brief, popular account is given of the symptoms of tomato canker (*Didymella lycopersici*) [*R.A.M.*, i, p. 150], which was first observed in Holland in 1919, since when it has caused considerable damage. Control measures should include the removal of infected material and the disinfection of greenhouses, frames, storage rooms,

and the like, with 15 per cent. carbolineum solution; spraying with 1 per cent. Bordeaux mixture; the maintenance of a dry atmosphere; and half-an-hour's immersion of the seed before sowing in 0·5 per cent. germisan.

RITZEMA BOS (J.). **Septobasidium bogoriense Pat. op jonge Kinaboomen.** [*Septobasidium bogoriense* Pat. on young Cinchona trees.]—*Tijdschr. over Plantenziekten*, xxxii, 10, pp. 303–304, 1926.

This is a brief account, adapted from C. Bernard's paper in *Cinchona*, ii, p. 46, 1925, of the symptoms and mode of infection of the so-called 'grey dadap fungus' [*R.A.M.*, ii, p. 145; v, pp. 585, 652; vi, p. 1], which is stated to have caused considerable damage in a Sumatran cinchona plantation. The affected branches developed cankers and other malformations which eventually killed them. The only practicable control measures are the removal of infected material and the exclusion from the plantations of other hosts of the fungus, e.g., *Stachytarpheta*, *Erythrina*, *Tephrosia candida*, and *Crotalaria anagyroides*.

SPAULDING (P.) & RATHBUN-GRAVATT (ANNIE E.). **The influence of physical factors on the viability of sporidia of Cronartium ribicola Fischer.**—*Journ. Agric. Res.*, xxxiii, 5, pp. 397–433, 1 fig., 16 graphs, 1926.

The experiments described in detail in the present paper and directed towards establishing the influence of physical factors on the viability of the sporidia of *Cronartium ribicola* were carried out in 1923 and 1924 at Warrensburg, New York. The teleutospore material tested was collected from the same eight species of *Ribes* as are enumerated in the authors' previous paper [*R.A.M.*, v, p. 394]. The results showed that the time necessary for the production of sporidia from the teleutospores is influenced both by temperature and the length of storage of the material. The sporidia appear to need water for germination, but the thinnest film is sufficient. The viability of wet sporidia was decreased by bringing them to an air-dry condition and wetting them again, and the amount of injury, as shown by the reduction of the germination percentages, was directly proportional to the saturation deficit of the air in which sporidia were dried. Sporidia from all the tested species of *Ribes* survived exposures of nine or more hours, and some sporidia from *R. nigrum* as long as 26 hours, in an air-dried condition. Pre-cooling for any length of time over one minute appeared somewhat to stimulate the germination. In all the cases tested the sporidia produced secondary sporidia, the latter apparently being formed somewhat more readily by sporidia which were kept constantly wet.

DEMMON (E. L.) & HADLEY (E. W.). **Review. Factors determining natural reproduction of Longleaf Pine on cut-over lands in La Salle Parish, Louisiana. By H. H. Chapman, Yale University School of Forestry, Bulletin No. 16.**—*Journ. of Forestry*, xxiv, 7, pp. 807–811, 1926.

The reviewers believe that the death of 34 per cent. of longleaf

pine [*Pinus palustris*] seedlings between 1½ and 2 feet high due to *Septoria pini* [*Cryptosporium acicolum*] on the area studied by Chapman [*R.A.M.*, vi, p. 66] is a heavier loss than is to be expected on areas more typical of the pure longleaf pine type. The use of fire as a control measure, suggested by Chapman, is considered of doubtful advisability.

PETRAČIĆ (A.). **O uzrocima sušenja Hrastovih šuma u Hrvatskoj i Slavoniji. O pojavu sušenja sa šumsko-uzgojnog gledišta.** [On the causes of desiccation of Oak forests in Croatia and Slavonia. Some aspects of the desiccation from a silvicultural point of view.]—*Annales pro Experimentis Foresticis*, Zagreb, i, pp. 119–127, 1926. [German summary.]

In view of the increasing interest taken by industrial and financial circles in Jugo-Slavia in regard to the threatening dying-off of oaks (chiefly *Quercus robur* and *Q. pedunculata*) in the forests of Croatia and Slavonia [*R.A.M.*, vi, p. 5], a commission of specialists, on which the author served as expert silviculturist, was appointed to investigate the causes and various aspects of the trouble. In the present interim report, written from a purely silvicultural standpoint, the author states that the dying-off of the oaks started in 1909, after an epidemic outbreak of *Microsphaera alphitoides* [*M. quercina*]. His observations lead him to consider that it cannot be attributed to unfavourable conditions of the soil, although the incidence is slightly greater in moist than in drier ground. In his opinion the primary cause is the destruction of the first leaves by the caterpillars of *Liparis dispar*, which forces the trees to put forth new leaves at a moment when environmental conditions are very favourable for the development of the powdery mildew. Repeated year after year, this process gradually devitalizes the trees and finally leads to their death, which is accelerated by the attacks of *Agaricus melleus* [*Armillaria mellea*] on the weakened trees.

ŠKORIĆ (V.). **Uzroci sušenja naših Hrastovih šuma.** [Causes of the dying-off of our Oak forests.]—*Annales pro Experimentis Foresticis*, Zagreb, i, pp. 234–246, 2 pl., 1926.

As a result of investigations carried out on the causes responsible for the dying-off of oaks in the Slavonian forests [see preceding abstract], the author describes in some detail the phenomena precursory to the death of the trees, and agrees with Petračić's finding that leaf-destroying caterpillars are the primary cause of the trouble, the action of the powdery mildew [*Microsphaera quercina*] and of *Armillaria mellea* on the weakened trees being but secondary, though important, causes. The dying-off can only be controlled by measures directed towards the suppression of the insects, and all the dead trees should be removed as soon as possible from the forests, as they are a constant danger to the living oaks.

DUFRÉNOY (J.). **La maladie de l'encre des Chatâigniers.** [The ink disease of Chestnuts.]—*Rev. Gén. des Sciences*, xxxvii, 17–18, pp. 507–510, 8 figs., 1926.

An account is given of the etiology, symptoms, and mode of

infection of ink disease of chestnuts (*Blepharospora cambivora*) [*R.A.M.*, v, p. 586], with some general observations on its economic consequences and on the administrative problems involved in its control.

GRAVES (A. H.). **The cause of the persistent development of basal shoots from blighted Chestnut trees.**—*Phytopath.*, xvi, 9, pp. 615–621, 1 fig., 1926.

This is a fuller account of the author's investigations on the cause of the apparent rehabilitation of chestnut trees affected by blight (*Endothia parasitica*) than that already noticed from another source [*R.A.M.*, v, p. 526].

VAN DER MEER (JIKKE H. H.). **Verticillium-wilt of Maple and Elm-seedlings in Holland.**—*Phytopath.*, xvi, 9, pp. 611–614, 1 pl., 1 fig., 1926.

In March, 1925, *Verticillium dahliae* [*R.A.M.*, iv, p. 495] was isolated from diseased maple seedlings, and in the following September the writer observed two cases of wilt [ibid., v, p. 641] in nine-year-old trees of *Acer platanoides* var. *schwedleri* at Wageningen. One of the affected trees, which bore several dead and defoliated branches and showed little new growth, was examined in detail. Transverse sections through the trunk, branches, and roots showed a characteristic discoloration of the wood, namely, a brownish-green spot with a fimbriate, dark green edge, while stipples of the same colour occurred in the spring wood of the youngest annual rings. These symptoms resemble those of wilted cherry seedlings [loc. cit.], except that in the latter host the diseased wood was brown. The annual ring of 1925 was poorly developed and completely absent where cankers (associated with *Nectria cinnabarina*) occurred at the bases of some of the branches. The discoloration of the 1924 and 1925 annual rings could be traced longitudinally from the rings up to some two-year-old shoots, and in one case even as far as the current season's growth.

V. dahliae was isolated from the woody tissue of the three different parts of the tree, the vessels of the 1925 annual ring being chiefly affected, while the fungus was also observed in a two-year-old shoot. Microscopic examination revealed a yellowing of the vascular walls and the presence of a gummy substance within the vessels, radial sections of which, stained with cotton blue, were found to contain the mycelium of the fungus.

In October, several specimens of elm (*Ulmus campestris*) in the same locality showed the typical symptoms of *Verticillium* wilt, including yellow blotches on the leaves, stunting, partial defoliation, and brown discoloration of the wood. Microscopic examination showed the typical disorganization of the vascular elements described above. *V. dahliae* was isolated from the roots, stems, and branches, and even from the top of a shoot.

KINZEL (W.). **Der Hausschwamm.** [The dry rot fungus.]—*Prakt. Blätter für Pflanzenbau u. Pflanzenschutz*, iv, 7, pp. 157–163, 2 figs., 1926.

This is a brief, popular description of the damage to structural

timber caused by the dry rot fungus (*Merulius lacrymans*), with notes on its life-history, the conditions promoting infection, and control methods. The connexion between this fungus and its sylvan form [*R.A.M.*, vi, p. 9] is indicated, and a discussion is given on the legal aspect of infection by dry rot in dwelling-houses and the like.

DUNLAP (M. E.). **The painting of treated wood.**—*Indus. & Engin. Chem.*, xviii, 10, p. 1091, 1926.

Success in the preservative treatment of timber in retail yards and mills is stated frequently to require, not only the thorough penetration of the wood with preservatives, but also facility in the subsequent painting of such materials. Creosote is known to be extremely difficult to paint, but water-soluble preservatives [*R.A.M.*, v, p. 68] offer greater facilities in this respect.

In view of the lack of accurate information on this subject, a series of painting tests has been initiated by the Forest Products Laboratory, Madison, Wisconsin, on woods treated with creosote, mixtures of creosote and montan wax [*R.A.M.*, vi, p. 67], gas oil, pine oil, sugar, borax, zinc chloride, sodium fluoride, triolith, mercuric chloride, and Ac-Zol. Satisfactory treatments usually necessitate the use of 10 to 15 lb. preservative oils or ½ lb. dry salt per cu. ft. of wood. Mercuric chloride is not absorbed in such large quantities as the other salts.

Two sets of panels were made from the treated material—one painted white for exposure on a fence, and the other coated with white, grey, blue, or chrome green paint, as well as with spar varnish, for exposure on a roof and indoors. All the paints except the chrome green have a white lead base. Three applications were given.

It was found impossible to do satisfactory painting directly over creosote with white lead paint, and even with sealers specially designed for covering bitumens an undesirable yellowing of the paint film occurred. Mixtures of montan wax and creosote (20–80 and 40–60) provided better surfaces, but staining was still observed in proportion to the quantity of creosote in the mixture. Gas oil produced a yellow spotting of the paint, and pine oil broke through the coating of one board at a number of points. The remaining seven water-soluble preservatives produced no discoloration of the paint. Chrome (Brewster) green can be satisfactorily applied over creosote, but dries slowly, and varnish may also be used successfully with any of the above-mentioned materials.

After three months' outdoor exposure the panels treated with creosote showed damage from bleeding and checking, while those treated with wax-creosote, gas oil, or pine oil were also in bad condition. No apparent change was detected in the panels treated with the water-soluble preservatives, or in those subjected to indoor exposure.

JACOMETTI (A. W. A.). **Het dwarsliggervraagstuk voor de railbanen van Suikerfabriken op Java.** [The question of sleepers for the railways of Java Sugar factories.]—*Arch. Sukerind. Nederl.-Indië*, xxxiv, 40, pp. 1145–1148, 1926.

The comparative merits of iron sleepers and those made of wood

treated with preservatives for the railways of Java sugar factories are discussed in connexion with van Swaay's recent paper [*R.A.M.*, v, p. 642]. Some statistics are cited from the State Railways which point to the superiority of steel sleepers over those made of teak [*Tectona grandis*], both as regards economy and durability. Further investigations should be made, however, on this important problem, especially with a view to the utilization of the abundant supplies of native timbers in the Dutch East Indian forests. In a postscript to this paper (pp. 1148–1149), H. E. C. Poortman states that plans have been made to test the amenability to creosote treatment of various species of native timbers at the Technical College of Bandoeng.

DEUTELMOSER (E.). **Pflanzenschutzliche Massnahmen im Gemüsebau. I. Massnahmen gegen pflanzliche Schädlinge.** [Plant protective measures in vegetable culture. I. Measures against fungous pests.]—*Obst. u. Gemüsebau*, lxxii, 19, pp. 291–292, 1926.

In addition to notes on the composition and application of a number of standard fungicides, the writer mentions various other points of interest. A preparation called herniol (Hausmullsverwertungs G. m. b. H., Tuchheim bei München) was found efficacious, when mixed with the soil, in the control of club-root of cabbage [*Plasmodiophora brassicae*]. Spraying with 0·5 to 2 per cent. Bordeaux mixture is recommended for the prevention of rust of peas, beans, celery, and asparagus [*Uromyces pisi*, (?) *U. fabae* or *U. appendiculatus*, (?) *Septoria apii*, and *Puccinia asparagi*, respectively]; leaf spot of peas and beans [*Ascochyta pisi*]; leaf mould [*Cladosporium fulvum*] and fruit rot of tomatoes; and downy mildew of onions and cucumbers [*Peronospora schleideni* and *Pseudoperonospora cubensis*]. Finely ground sulphur dust or a solbar solution should be used for the control of the true mildews of peas and cucumbers [*Erysiphe polygoni* and *Sphaerotheca humuli* var. *fuliginea*]. Scab of celery [*Phoma apiicola*] and leaf blight of cucumbers [*Corynespora melonis*] can only be controlled by disinfection of the seed and of the soil in the seed-beds.

MELHUS (I. E.), ERWIN (A. T.), & VAN HALTERN (F.). **Cabbage yellows caused by Fusarium conglutinans in Iowa.**—*Iowa Agric. Exper. Stat. Bull.* 235, pp. 187–216, 9 figs., 1926.

Cabbage yellows (*Fusarium conglutinans*) has caused heavy losses (up to 50 to 95 per cent. of the crop in certain cases) to growers in Iowa during recent years. It appears that the organism may live in the soil for at least eleven years and still be destructive. It was first reported in Iowa in 1910 and is said to be unknown outside the United States [but see *R.A.M.*, ii, pp. 335, 486].

A study of control measures has been in progress in Iowa since 1916, and in this paper, after a detailed description of the symptoms of the disease and its relation to environmental conditions, a record is made of the work carried out during the past eight years, based chiefly on the selection and development of disease-resistant strains in the varieties best adapted to existing soil and climatic conditions. Comparative tests under greenhouse conditions indicate the value

of the Iacope strain of cabbage, selected from the variety Copenhagen Market for resistance to this disease. Resistance varies, however, with degree of soil infestation and with weather conditions. Continued selection in infected soil through four generations has increased the degree of resistance. The yield is good, but there is less uniformity in type and time of maturity than the earliest strains of Copenhagen Market. At present Iacope is recommended for use only where an early crop of cabbage is desired, and on land that is infected with *F. conglutinans*.

A new fungus pest of Beans.—*Science*, N.S., lxiv, 1655, p. x, 1926.

A brief note is given on the ravages of *Macrophoma phaseoli* [*R.A.M.*, v, p. 722] among the bean crops of Georgia, Mississippi, and South Carolina, where it is stated to be spreading rapidly. The virulence of the disease and its already wide distribution since its first discovery in the United States in 1923 suggest that it will quickly spread over the bean-growing areas of the country and take a heavy toll in moist seasons. The appearance of the numerous black fructifications of the fungus on the grey background characteristic of dead bean stalks and branches suggests the use of 'ashy stem blight' as an appropriate term for the disease.

ESMARCH (F.). **Die Brennfleckenkrankheit der Bohnen.** [Anthracnose of Beans.]—*Die Kranke Pflanze*, iii, 10, pp. 181–185, 1 fig., 1926.

The writer gives a semi-popular description of the symptoms of bean anthracnose (*Colletotrichum lindemuthianum*), which is stated to have been prevalent in Saxony, where it had not been previously reported, during the damp summer of 1926, together with an account of the life-history of the causal organism and measures for the control of the disease based on the work of Schaffnit [*R.A.M.*, iv, p. 456].

MURPHY (P. A.) & M'KAY (R.). **The downy mildew of Onions (Peronospora schleideni) with particular reference to the hibernation of the parasite.**—*Sci. Proc. Royal Dublin Soc.*, N.S., xviii, 17–28, pp. 237–261, 4 pl., 2 figs., 1926.

In a note published in 1921 [*R.A.M.*, i, p. 100], attention was drawn to the fact that the mycelium of the onion mildew fungus *Peronospora schleideni* is capable of a perennial existence in the scale leaves of the bulbs. Later on the same mycelium was found invading the stem or root-stock. The effects of the disease on the bulbs and the development of diseased shoots and subsequent production of mildew on the surface of the leaves are now described in detail.

Further proofs of the identity of the mycelium with *P. schleideni* have since been obtained and are described. Spraying the foliage with conidia of this fungus produced the mildew, and in turn the bulbs became infected with mycelium. The appearance of mildew on the shoots that developed from infected bulbs in the following spring was repeatedly demonstrated and clearly indicated the perennial nature of the mycelium. In several cases the mycelium

was directly traced from the bulbs up to the leaves. Once the shoots are invaded they remain infected throughout, as the parasite keeps pace with their growth, though it does not die off or become less vigorous in the basal portions. A certain stage of development of mycelium within the leaf is evidently essential prior to the formation of conidia, as was shown by the failure of conidiophores to appear on the young leaves of systemically infected plants containing abundant mycelium when the older leaves were covered with mildew. The yellowing of the leaves is the first external sign of the presence of the parasite. The chlorophyll grains gradually lose their outline, producing a uniform green slime which later turns yellow. Diseased bulbs turn rather soft and produce green shoots prematurely. The first fleshy scale found below the dry outer scales becomes corrugated, shiny, brownish, and watery. Scales farther in show no symptoms, though they may be equally infected. The meristem and deeper layers of the compressed stem are also invaded, but the roots are not attacked. Direct spread from scale to scale does not seem to occur.

The negative results obtained by the authors from all attempts to infect the bulbs directly, and the proved ability of the fungus to penetrate the bulbs through the leaves has led to the conclusion that the latter is the only method by which the bulbs are invaded under natural conditions. There appears to be no danger of the disease spreading in storage, although it may sometimes happen that conidia are produced on the surface of green shoots from diseased bulbs in very damp weather in autumn or early winter.

Perennial mycelium is extremely common in this disease in Ireland as compared with resting spores (oospores), which are only occasionally found on the leaves and evidently play a minor part in perpetuating the fungus. Observations point to the fact that the production of conidia and resting spores are antagonistic processes: the latter are more frequent in leaves showing an absence of conidia.

The danger from autumn-sown seed, the seedlings from which become infected and carry the disease through the winter, is emphasized, and precautions to reduce the risk from this source are outlined. Onion setts, potato-onions (*Allium cepa* var. *multiplicans*), shallots (*A. ascalonicum*), onions grown for seed, Egyptian onions, and possibly other species of *Allium* may be carriers of infection, and capable of originating the disease in the spring. Experiments are in progress to ascertain whether conidia from one plant will infect plants of another species. The results at present indicate that the fungus from *A. cepa* readily attacks *A. ascalonicum*, and *A. cepa* var. *bulbelliferum*, but under the same conditions *A. porrum*, *A. fistulosum*, *A. sativum*, *A. scorodoprasum*, and *A. schoenoprasum* did not contract the disease. No evidence of infection of the seed was secured.

Up-to-Date was the most resistant variety observed by the authors in 1922, followed in order by Stirling Exhibition, All-the-Year-Round, and an American variety, Wethersfield Red, which was clearly the worst. In 1923, Ailsa Craig proved the most resistant of a number of varieties, but showed 20 per cent. of the plants killed by the mildew.

The results of treatment of infected bulbs by dry heat of varying degrees of intensity showed that treatments at 40° C. for 8, 16, or 24 hours, or at 38° for 16 hours were sufficient to kill all the mycelium in the bulb without causing apparent injury to the host.

Attempts to grow the fungus on artificial media were unsuccessful.

TAUBENHAUS (J. J.). **Studies of a new Fusarium wilt of Spinach in Texas.**—*Texas Agric. Exper. Stat. Bull.* 343, 23 pp., 5 figs., 1 graph, 1926.

A hitherto unreported disease of spinach has been under observation by the author for the last five years in Texas. It is a form of wilt, which causes stunting of the plants and subsequently their decoloration and gradual death. The losses from it have been serious, amounting in some cases to 20 to 70 per cent. of the late plantings. The roots of affected plants are rotted, so that the plants can be easily pulled out, and their vascular bundles and other internal tissues are of a brownish colour.

A species of *Fusarium* was isolated from the diseased roots and was found to be identical with *F. solani*. Pathogenicity was definitely established by inoculating healthy spinach with pure cultures of this organism both from spinach and from potatoes (those from the latter received from Sherbakoff), with the production of typical symptoms of the disease.

Comparisons were made with *F. spinaciae*, the organism responsible for the spinach wilt in Idaho [*R.A.M.*, iii, p. 72], and the two organisms were found to be distinct. On potato starch agar, *F. spinaciae* produces a flat, glossy or shiny, whitish or dirty cream, superficial growth, with no discoloration of the substratum, and the cultures have a strong fermenting odour. On the other hand, the Texas organism in similar cultures makes a restricted, raised, fluffy, white to olive, buff, or greenish-blue growth, with a distinct browning of the substratum, and no odour. The macroconidia are in both cases generally 3-septate, but they are relatively shorter in *F. solani* (27 to 34 by 5·4 to 5·8, against 27 to 45 by 4·5 to 6·4 μ), and they are without a distinct pedicel and not much constricted at the apex in the latter, whereas in *F. spinaciae* they are pedicillate and abruptly constricted. The chlamydospores are rough-surfaced, with one to three septa in *F. solani*, and non-septate, with a mostly smooth wall in *F. spinaciae*.

Soil temperature is evidently an important factor in the spread of spinach wilt in Texas. The higher the temperature the more prevalent is the disease. This accounts for the large percentage of loss in the late-planted varieties. The table giving the temperature readings covering the period March to June, 1925, clearly shows that the increase in percentage of wilt corresponds to the rise in both air and soil temperatures as the season advances. Only 1 per cent. of wilt was recorded in March, 1925 (mean atmospheric temperature 72·3° F., mean soil temperature at a depth of two inches 70·4°), as compared with 63 per cent. in June (corresponding temperatures 93·8° and 89·3° respectively). Under Central Texas conditions the disease does not spread if the average outdoor

temperature is 72°, and the soil temperature 70° at a depth of two inches, or 68° at a depth of four inches.

As a means of control, it is recommended to plant early enough to avoid high temperatures. If it is necessary to use late-planted spinach, which has a higher market value, this should not be planted on land previously under spinach or potatoes, and it is preferable to plant after maize, sorghum, or some other similar crop.

Practically all the varieties of *Spinacia oleracea* tested appear susceptible to this wilt, but New Zealand spinach (*Tetragonia expansa*) has proved to be completely resistant, and is also adapted to growth at high temperatures.

In connexion with this disease, a new *Rhizoctonia* root rot has been observed, characterized by cankered lesions which are confined to the collar or roots. There appear to be certain distinctive differences between the organism causing this disease and the *Rhizoctonia* responsible for sore shin of cotton [*R. solani*] in Texas.

TEMPEL (W.). **Die Schorfrankheit der Sellerieknollen (Phoma apiicola Klebahn).** [The scab disease of Celery bulbs (*Phoma apiicola* Klebahn).]—*Die Kranke Pflanze*, iii, 10, pp. 188–190, 1 fig., 1926.

Of recent years a number of the thickened root-stocks of celery [apparently of the celeriac type] showing more or less deep, irregular fissures on the surface have been examined at the Dresden Plant Protection Head-quarters. The insects and bacteria which occur in profusion in the diseased tissue are thought to be only secondary agents of decay, the primary cause being *Phoma apiicola*. The most severe damage occurs during protracted storage under humid conditions, while considerable losses may also be sustained in the field, especially where the root-stocks are overwintered in sand for use as seed bearers in the spring. Infection being disseminated mainly by the spores on plant refuse or in the soil, regular crop rotation should be practised, while the disinfection of seed-beds with a 1 in 5 formalin solution is also recommended.

BOYD (O. C.). **Further experiments in the control of Watermelon anthracnose with dusts and sprays.**—Abs. in *Phytopath.*, xvi, 9, pp. 641–642, 1926.

Experiments in the control of anthracnose [*Colletotrichum lagenarium*] of Watson watermelons begun at Thomasville, Georgia, in 1924 were continued in 1925. Bordeaux mixture 4–8–50 and a home-mixed and a commercial copper-lime dust, both containing 20 per cent. monohydrated copper sulphate, were used, kayso being added to the Bordeaux as an adhesive in the last three applications, six of which were given in each case at intervals of seven to ten days. The sprayed vines retained more fungicide per unit amount of copper applied than the dusted ones, and the spray deposit was more resistant than the dust to washing by rains. However, the dusts, applied at the rate of 15 to 80 lb. per acre, furnished satisfactory control. The net returns per acre were calculated at $25·57 for the untreated plots, $67·37 for the sprayed,

$58·38 for those treated with home-made dust, and $36·70 for those treated with the commercial dust.

SUNDARARAMAN (S.). **Vermicularia curcumae Syd. on Curcuma longa.**—*Madras Agric. Dept. Year Book 1925*, pp. 18–19, 1926.

Turmeric (*Curcuma longa*) is stated to be severely attacked by *Vermicularia curcumae* [*R.A.M.*, iii, p. 570] in the Godavari, Kistna, Trichinopoly, and Coimbatore districts of Madras, India.

The disease first occurs on the leaves, which show elliptical or oblong, coalescent, amphigenous spots, 1 to 3 cm. in length and surrounded by a yellowish-brown zone. Superficial, subdivided, dark pycnidia, 60 to 90 μ in diameter, with erect, dark brown, septate setae, measuring 50 to 90 by 6 to 7 μ, occur in the centre of the spots. The sub-fusoid, unicellular, hyaline spores, tapering at both ends and containing minute oildrops, measure 18 to 29 by 3 to 5 μ. From the foliage, infection passes to the rhizomes.

Oat-juice agar was found to be the best culture medium. Inoculation experiments with pure cultures of *V. curcumae* gave positive results on cabbage, knolkohl [*Brassicae oleracea* var. *caulo-rapa*], chillies [*Capsicum annuum*], brinjal [*Solanum melongena*], and *Withania somnifera*.

Affected rhizomes and their scaly leaves showed dark sclerotial masses, which were also observed on oat agar cultures. This denotes the possibility of the perpetuation of the fungus through the seed rhizomes. *V. curcumae* was proved to retain its viability in the sclerotial form for a period of three years.

SCHWARZ (M. BEATRICE). **Slijmziekte in de Cassave.** [Slime disease in Cassava.]—*Indische Culturen* (*Teysmannia*), xi, 17, pp. 498–499, 4 figs., 1926.

The writer recently observed in some diseased three months' old cassava [*Manihot utilissima*] plants at Preanger (Java) macroscopic and microscopic symptoms [which are briefly described] typical of the slime disease due to *Bacterium solanacearum*. Pure cultures of the bacteria isolated from the discoloured vascular bundles agreed with this organism. Inoculations on tomato seedlings gave positive results. The disease chiefly affected the S.P.P. and red Singapore varieties, the Criolinha being apparently resistant. The secondary forest soil in which the crop was growing had lain fallow for four months after 1½ years under cassava.

PÉE-LABY (E.). **Coulure et maladies de la Vigne. Pronostics de récolte.** [Shedding of fruit and diseases of the Vine. Harvest prospects.]—*La Vie Agric. et Rurale*, xxix, 38, pp. 188–189, 1926.

In connexion with a survey of the prospects for the 1926 vine harvest, the writer refers to the abnormal shedding of the fruit in the south-western region of France as a result of the abruptly fluctuating meteorological conditions during the spring and early summer. Brief notes are also given on the following diseases: *Oidium* [*Uncinula necator*], mildew [*Plasmopara viticola*], and anthracnose [*Gloeosporium ampelophagum*].

WORMALD (H.). **Plant pathology. Programme of research with brief progress reports.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1925, to 31st December, 1925*, pp. 61–63, 1926.

Besides information already noticed from other sources, the present paper contains the following items of interest.

Inoculations made with conidia of *Sclerotinia cinerea* on unopened flowers of Morello cherries have, in a few cases, given positive results, indicating the value of a pre-blossom spray as a control measure for the blossom wilt of this variety.

Inoculation experiments with *Cercospora cantuariensis* on a number of hop varieties have invariably produced the usual symptoms of leaf spot disease [*R.A.M.*, iii, p. 61].

Further studies on the association of bacteria with the wilt of plum shoots [ibid., v, p. 277] have shown that inoculations of the bacterium isolated from wilted shoots give rise not only to the wilt symptoms but also produce cankered areas on the branches. This indicates that the organism can cause infection of the older tissues, although actual dying back (except of young green shoots of the current year) has not been obtained. The same organism inoculated into leaves by punctures produced a leaf spot and shot hole. A bacterium obtained from a leaf spot of cherry gave rise to lesions when inoculated on healthy shoots and leaves.

A bacterium was isolated from leaves of broccoli and Savoy cabbage affected by black rot, and was found to agree with *Bacterium campestre* [*Pseudomonas campestris*], but inoculation experiments have not yet been carried out with this organism.

POLE EVANS (I. B.). **The protection of plant life. A year's work. Annual Report of the Secretary for Agriculture. Year ended 30th June, 1926. Report No. IV.**—*Farming in South Africa*, i, 9, pp. 331–333, 2 figs., 1926.

This report contains the following items of interest in addition to others already noticed in this *Review*.

A fresh outbreak of citrus canker [*Pseudomonas citri*] occurred during the year in an experimental orchard at Buffelspoort which may be regarded as a sequel to the outbreak of the previous wet season [*R.A.M.*, iv, p. 529]. No further cases of infection were found in private orchards in the quarantined area.

Owing to the dry season, wildfire of tobacco [*Bacterium tabacum*] was not prevalent, but tobacco wilt [*Bact. solanacearum*] was reported from the Western Transvaal, being especially serious in the Kat River Valley. A curious and obscure 'curly leaf' disease of tobacco occurred in several areas, and two supposed virus diseases of tobacco and tomato, respectively, new to South Africa, are also being investigated.

Several cases of cotton wilt [*Fusarium vasinfectum*] were encountered, and internal boll rot, the cause of which is under study, led to heavy losses in certain areas.

Cross-transmission studies on the streak disease of maize, sugarcane, and other grasses [*R.A.M.*, v, pp. 188, 698; vi, p. 55] indicated either that a number of viruses are concerned in the disease in the several hosts, or that a single virus has in course of time become specialized to particular hosts. The overwintering of the

streak virus which affects annual plants is believed to occur in leafhoppers which survive through the winter.

In variety trials against ground-nut rosette carried out in severely affected regions, the Virginia Bunch proved the most resistant.

Bon Chretien pears, obtained from various localities, showed big differences in their storage behaviour and chemical composition, and also in their susceptibility to scald.

Citrus fruits were subjected to borax treatment [*R.A.M.*, vi, p. 92] with good results. It was found that fruit dipped for five minutes in a 5 per cent. borax solution showed 50 per cent. less waste than the untreated. Treatment given after grading was more effective than that before grading but not so good as treatment in the grove itself.

BUNTING (R. H.). **Annual Report for the year 1925–26.**—*Rept. Agric. Dept. Govt. Gold Coast for the period April, 1925, to March, 1926*, pp. 32–33, 1926.

The following are some of the chief references of phytopathological interest contained in this report.

A disease of cacao pods, which is termed stripe disease and is apparently of bacterial origin, occurred in southern Ashanti. Infection was first evident as a longitudinal, brown discoloration of the ridges of the pods; the seeds were not affected.

A bacterial wilt of maize found in Ashanti is under investigation. Maize leaf blight (*Helminthosporium turcicum*) was successfully reproduced by inoculation with cultures of the causal organism. The fungus causing leaf spot of the same crop was determined as *Ophiobolus heterostrophus* [*R.A.M.*, v, p. 293]; it is probably also responsible for a blackening of the staminate inflorescences.

The sclerotial stage of a fungus collected from the ears of bulrush millet (*Pennisetum typhoideum*) at Tamate appears to belong to the genus *Sphacelia*, and its physiological effect on animal consumers indicates its relationship to the ergots [*Claviceps*].

Solanum melongena [eggplant] was attacked by the African form of *Aecidium tubulosum* at Asuansi.

In Aburi, a mild attack of *Diplodia agaves* on sisal hemp [*Agave rigida* var. *sisalana*] occurred during the early part of the year and was probably favoured by heavy rainfall.

The fungus associated with banana leaf blotch has been determined as *Cordana musae*, and that associated with stem rot of oil palms [*Elaeis guineensis*] as *Thielaviopsis paradoxa*.

The following fungi were recorded for the first time in the Gold Coast. *Acrothecium lunatum* and *Basisporum gallarum* on rice and maize; *Clasterosporium maydicum* on maize; *Helminthosporium oryzae* on rice; *Asterina lawsoniae* on *Lawsonia alba*; *Epichloë cinerea* and *H. ravenelii* on *Sporobolus pyramidalis*; *Cintractia axicola* var. *minor* on *Mariscus umbellatus*; *Ustilago heterospora* and *Fusarium heterosporium* on *Panicum maximum*; *Puccinia heterospora* on *Sida rhombifolia*; and *Tubercularia coccicola* on *Mytilaspis citricola* [*Lepidosaphes beckii*] on lime trees.

DADE (H. A.). **Annual Report, 1925–1926.**—*Rept. Agric. Dept. Govt. Gold Coast for the period April, 1925, to March, 1926*, pp. 33–36, 1926.

A canker disease, although of infrequent occurrence in the Gold Coast, has caused severe damage to a large number of cacao trees in certain localities subject to high floods and other conditions which render them unsuited to the growing of cacao. The cause is as yet unknown, for though the symptoms correspond exactly to those described elsewhere as due to *Phytophthora faberi*, attempts to isolate this organism from the cankers have failed. *P. faberi* is a common cause of pod rot of cacao in the Gold Coast. Collar rot (*Ustulina zonata*) of cacao has been found in several new localities during the year. The disease is evidently associated (as in other countries) with attacks of bark-boring beetles. Brown root disease (*Fomes lamaoensis*) is the commonest root affection of cacao in the Gold Coast. White thread (*Marasmius scandens*) [*R.A.M.*, iii, p. 710] has caused heavy infection, to the extent of 100 per cent., on some cacao farms, but control measures are up to the present proving effective against this parasite. A case of teratoid hyperplasia in cacao was found in the Adieso district and, like similar tumours previously found in Ashanti, is thought to be due to *Bacterium tumefaciens*.

Panama disease (*Fusarium cubense*) of bananas has not been found in the Gold Coast up to date, in spite of careful searches. A finger-tip rot of Canary bananas [*Musa cavendishii*] was found at Aburi, associated with a species of *Verticillium* (*Stachylidium*) similar to, and perhaps identical with the organism found in the 'hongo' finger-tip rot common in the Canary Islands. In this variety of banana the dead flowers adhere to the fruit, and a very imperfect cork layer is formed; infection takes place through this path. A black saprophytic mould (*Rhizopus nigricans*) follows the rot.

The following new records were made during the year. *Poria hypobrunnea* on cacao, *Cercospora sorghi* on guinea corn [sorghum], *Monotospora fasciculata* on oil palm, *Fusarium incarnatum* on *Bougainvillea spectabilis*, *Podonectria coccicola* and *Hypocrella olivacea* on citrus scale insects. A species of *Ustilaginoidea* which is probably new was found on *Setaria sulcata*.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1921. [Diseases and pests of cultivated plants in the year 1921.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 29, 245 pp., 3 maps, 1926.

In an introduction to the present report, compiled much on the same lines as the former [*R.A.M.*, ii, p. 199], Dr. Appel states that the difficulties which stood in the way of regular publication of these yearly reviews of diseases and pests of cultivated plants in Germany have now disappeared. The reports for the years 1922 to 1924 are already in print and that for 1925 is in course of preparation. It is hoped that henceforth the publication will be both punctual and regular. A large space in the present list is occupied by diseases and pests already recorded in the list published in No. 18 of these *Mitteilungen*, since their notification to the

Biological Institute at Dahlem was made compulsory by the 1919 decision of the Plant Protection Service.

A section, for which Werth [ibid., i, p. 68] is responsible, is devoted to phenological observations made in 1921, a small number of which refer to the appearance of certain diseases.

In a section dealing with the damage done to crops, Pape points out the high percentage of cases in which certification was refused in regard to certain crops, especially cereals and potatoes, on account of fungus diseases. The heaviest losses were caused by wheat bunt (*Tilletia tritici*), loose smut of wheat and oats (*Ustilago tritici* and *U. avenae*), stripe disease of barley (*Helminthosporium gramineum*), and foot rots of cereals (*Leptosphaeria herpotrichoides*, *Ophiobolus herpotrichus*, and *Fusarium* spp.). Potatoes suffered in 1921 considerably less from diseases than in former years, only 2·1 per cent. of the total crop having been found diseased as against an average of 3·2 per cent. for the decennium 1911 to 1920.

Among the numerous interesting records in the sections dealing with the fungal and physiological diseases of economic crops, for which Pape is responsible [with the exception of potato diseases, which have been dealt with by Schlumberger], the following are all that space permits of noticing.

Plumed spore disease (*Dilophospora graminis*) [*D. alopecuri*] was observed for the first time in the neighbourhood of Bonn on wheat and rye, with an incidence of about 30 per cent., and in Baden on wheat and spelt. It is believed that the disease was introduced with straw and seed from France and Switzerland, respectively. Sclerotium disease (*Typhula graminum*) was frequent in the spring on wheat in two districts of East Prussia. In the northern part of the Landsberg a. d. W. district it attacked chiefly barley, but was also recorded on wheat and rye. Also in Brandenburg its incidence on barley was high in a number of districts. Black sclerotium disease [species not indicated] occurred on rye in two districts of Brandenburg. Leaf spotting was caused by *Scoletotrichum graminis* on wheat, rye, and oats in several districts of East Prussia; by *Ascochyta graminicola* on rye in East Prussia and Pomerania; by *Septoria graminum* on rye, oats, and millet in East Prussia and on rye in Brandenburg; and by *S. tritici* on wheat in two localities of East Prussia. *S. glumarum* [*S. nodorum*] was found on the glumes of wheat in East Prussia; *Macrophoma hennebergii* [*S. nodorum*, *R.A.M.*, ii, p. 211] on wheat ears in one district of Württemberg; while black mould (*Cladosporium herbarum*) was observed in all districts of East Prussia towards the end of the season on wheat, rye, barley, and oats, but did not appear to be causing great damage; it was also found on rye, barley, and oats in some districts of Brandenburg. Stripe disease of oats (*Helminthosporium avenae*) was fairly frequent in several districts of East Prussia. Maize rust (*Puccinia maydis*) was very prevalent in one district of East Prussia. Maize smut (*Ustilago maydis*) [*U. zeae*] attained a high incidence in two districts of East Prussia, two districts of Brandenburg, and three districts of Saxony; in one of the latter it attacked maize manured with horse dung, while on a plot dressed with an artificial fertilizer the disease did not appear.

Wart disease (*Synchytrium endobioticum*) of potatoes was relatively less severe in 1921 owing to the general dryness of that year. A list is given of the new foci of infection that were notified. Notes are given on the incidence in various localities of potato blackleg (*Bacillus phytophthorus*) [*B. atrosepticus*]. The bacterial ring disease (*Bacterium sepedonicum*) was recorded in two localities of East Prussia on the variety Modell. Notes are also given on the following virus diseases of the potato: leaf roll, rosette ('Krauselkrankheit'), bouquet ('Bukettkrankheit') [*R.A.M.*, vi, p. 45], Barbarossa disease [ibid., iii, p. 100], and mosaic.

Tip rot of beets (*Bacillus bussei* and *B. lacerans*) was recorded in East Prussia, in the district of Landsberg a. d. W., in Mecklenburg, and in Bavaria. Beet yellows (*B. tabificans*) was found in one case in the district of Landsberg.

Blackleg (*Bacillus caulivorus*) was reported on yellow lupins [*Lupinus luteus*] in one field in East Prussia. Canker (*Gloeosporium caulivorum*) and leaf spot (*G. trifolii*) occurred on red clover [*Trifolium pratense*] in East Prussia.

Bacterial rot (*Bact. briosii*) of tomato fruit was prevalent, especially in greenhouses, in Pomerania.

Cherries suffered from blight (*Bacillus spongiosus*) in one locality of East Prussia, while scab (*Fusicladium cerasi*) was reported to have been very prevalent in Brandenburg, Saxony, and Hanover. In East Prussia pear blight (*B. amylovorus*) was recorded in one locality, while in a district of Hanover pear leaves were slightly attacked by *Septoria piricola*. Crown gall (*Bact. tumefaciens*) was observed on fruit trees in Brandenburg. *Vermicularia grossulariae* attacked gooseberries in four districts of East Prussia

A list is also given of diseases of forest trees and of ornamental plants, and the report terminates by an index of hosts and parasites.

KOPP (A.). **Problèmes agricoles urgents. Situation entomologique et phytopathologique.** [Important agricultural problems. Entomological and phytopathological situation.]—*Huitième Rapport Stat. Agron. Guadeloupe, 1925–1926*, pp. 32–38, 1926.

The following references in this report are of phytopathological interest. It is stated that Guadeloupe has not suffered to any marked degree from diseases and pests of crops. No new records have been made during the year.

The association between red rot of sugar-cane (*Colletotrichum falcatum*) and the moth borer (identified by the author with some doubt as *Diatraea saccharalis*) has been under observation. The cane usually remains healthy when the holes made by the borer are few and sparsely distributed, but if closely crowded red rot almost invariably follows. In such cases the major part of the injury to the cane is attributable to *C. falcatum*. Treatment of cuttings with Bordeaux mixture or other disinfectants has proved effective as a safeguard against the spread of this disease as well as others such as the rind disease caused by *Melanconium sacchari*. A *Cordyceps* found attacking the borer has been examined by Fron who thinks it possible that it is identical with *C. sobolifera*, previously known through its occurrence on insects on coffee plants in

Guadeloupe. The difficulties of propagation of this fungus appear, however, to stand in the way of its utilization on a large scale for the control of the borer. Root rot of sugar-cane has proved serious only on plantations which have been badly drained or suffer from lack of manure or from an excess of soil acidity.

Coffee diseases recorded during the year include those caused by *Omphalia flavida* (identified for the first time in Guadeloupe), *Sphaerella* [*Mycosphaerella*] *coffeicola*, *Cercospora coffeanum* [*C. coffeicola*], *Gloeosporium coffeanum* [*Glomerella cingulata*], and *Cephaleuros coffeae* [*C. mycoidea*].

Cook (M. T.). **Report of the Division of Plant Pathology and Botany.**—*Ann. Rept. Ins. Exper. Stat. Porto Rico, 1924–1925*, pp. 98–107, 1926.

Investigations have been continued on the diseases of sugar-cane. The eye spot disease due to *Helminthosporium sacchari* [*R.A.M.*, iv, p. 243], known locally as Manatí disease, has been found to vary greatly, both as to the symptoms and the morphology of the causal organism, according to the variety of cane attacked and the conditions of the environment. A dry form of top root has been observed and is under study in a plantation of 300 acres. Sugar-cane root disease is regarded as a complex condition in which certain fungi are of importance as causal agents, but probably soil conditions are sometimes involved as well.

Nut fall in coco-nut following infection by *Thielaviopsis paradoxa* [*R.A.M.*, iv, p. 216] has been under observation, and the removal of infected leaves, fruits, and bark has done much to check the spread of this disease. Bud rot [*Phytophthora palmivora*] caused heavy losses in the east of the island.

A list of the more important crop parasites observed during the year is given. Amongst these the following may be mentioned. Fruit rot (*Colletotrichum gloeosporioides*) of avocado; *Pestalozzia guepini*, which caused severe damage to seedling avocados; carrot leaf blight (*Macrosporium carotae*); stem-end rot of citrus (*Diplodia natalensis* and *Penicillium* spp.); citrus wither-tip (*Colletotrichum gloeosporioides*), which causes the premature fall of the fruits; citrus melanose (*Phomopsis citri*), false melanose or grease spot (cause uncertain), and tear stain due to various causes; grey spot (*Cercospora coffeicola*), leaf spot (*Stilbella* [*Omphalia*] *flavida*), and black rot or koleroga (*Pellicularia* [*Corticium*] *koleroga*) of coffee; leaf spot (*Cercospora gossypina*), rust (*Kuehneola gossypii*) [*K. desmium*], and root rot (*Fusarium* sp.) of cotton, the last-named causing much damage in one case; leaf spot (*Cercospora vignae*) and grey spot (*C. cruenta*) of cowpea; leaf spot (*C. capsici*), which caused a severe leaf fall, and anthracnose (*Colletotrichum nigrum*) of chilli pepper; rind disease (*Melanconium sacchari*), red rot (*Colletotrichum falcatum*), leaf spots (*Phyllosticta sacchari* and *Cercospora vaginae*), and gummosis amongst other diseases of sugar-cane; two forms of leaf spot caused, respectively, by a species of *Macrosporium* and by *Phyllosticta colocasiae*, and two forms of root rot, the one bacterial, and the other caused by *Sclerotium rolfsii* on yautía [*Xanthosoma*].

MAGROU (J.). **Le Bacterium tumefaciens dans les tissus du cancer des plantes.** [*Bacterium tumefaciens* in the tissues of plant cancer.]—*Comptes rendus Acad. des Sciences*, clxxxiii, 19, pp. 804–806, 1926.

The author states that in sections of large stem tumours from tomato plants, fixed from two to five months after inoculation with *Bacterium tumefaciens*, he observed very numerous bacteria on the surface of the gall or penetrating only the most superficial cell layers. No bacteria were found at points where the epidermis was intact; they only occurred in places where the epidermis was broken through by the underlying neoplasm. The invaded tissues always consisted of large, apparently dead cells without nuclei and frequently with thickened walls, while the neoplastic nodules, consisting of small, proliferating cells, were always free from the invasion; in the rare cases where a superficial islet of the tumour was invaded by the bacteria, its parenchymatous elements were completely destroyed, and only its vessels, occasionally filled with bacteria, remained. Isolations from these superficial lesions yielded an organism which, in pure culture, produced colonies typical of *Bact. tumefaciens*, and which, upon inoculation into *Pelargonium*, reproduced the characteristic tumours, while no organism developed from fragments of tissue taken from the deeper parts of the tumour. These observations, which agree with those of Robinson and Walkden [*R.A.M.*, iii, p. 15] and of Pinoy [ibid., iv, p. 338], suggest, in the author's opinion, that *Bact. tumefaciens* exerts an action at a distance on the cells, resulting in the proliferation of the latter.

MAGROU (J.). **Sur l'anatomie du cancer des plantes ou crown-gall.** [On the anatomy of cancer of plants or crown gall.]—*Comptes rendus Acad. des Sciences*, clxxxiii, 21, pp. 986–988, 1926.

The author states that in stem tumours, experimentally induced by inoculation with *Bacterium tumefaciens* in the sunflower (*Helianthus annuus*), tomato, and castor (*Ricinus communis*), he frequently found supernumerary steles either in the pith or in the cortex. In all the cases observed by him, such steles in the cortex were of a normal structure, i.e., with phloem developing around a central cylinder of wood, whereas in those that occurred within the pith the phloem developed inside, and the xylem outside the cambium layer, and their central parenchyma bore the character of a true cortex.

According to the author, the formation of the tumours under the action of *Bact. tumefaciens* is essentially a consequence of an acceleration of cell division in the cambium. In a tangential direction, this acceleration leads to the thickening of the meristematic zone, while in a radial direction it leads to the lengthening of the ring of cambium; the latter, hemmed in by the surrounding tissues, cannot long remain circular and is forced to assume a sinuous contour; it then forms evaginations which protrude into the cortex or invaginations which advance into the pith. The deformed cambium continues, however, its normal functions, differentiating wood from its internal surface and phloem at its periphery.

Consequently, where the cambium bulges out into the cortex, the phloem is located on the outside, and the xylem inside the bulge, while where the cambium is invaginated into the pith the opposite occurs. When the lips of the folds join together, this results in the formation, inside the pith parenchyma, of steles with internal phloem and external wood, and inside the cortex, of steles with external phloem and internal wood. It is further stated that similar structural abnormalities are met with in the normal anatomy of certain plants.

A parallel is drawn between such steles with inverted structure in plant tumours and certain neoplasms in animal cancers. For example, the horny spheres in epidermal cancers also exhibit an inverted structure; their centre, occupied by keratinized cells, is homologous with the normal epidermal surface, while at their periphery they bear the germinative layer; the latter, hindered in its development by its excessive proliferation, becomes invaginated into the underlying conjunctive tissue. This similarity between the histogenesis of crown gall in plants and that of malignant growths in animals is considered to be a further argument in favour of the cancerous nature of the galls produced in plants by *Bact. tumefaciens*.

RIKER (A. J.) & KEITT (G. W.). **Studies of crown-gall and wound overgrowth on Apple nursery stock.**—*Phytopath.*, xvi, 11, pp. 765–808, 10 pl., 2 figs., 1926.

The object of this communication is to show that the bulk of those deformities of grafted apple trees appearing in the neighbourhood of the graft and previously attributed to crown gall are not in fact due to the organism of the latter disease (*Bacterium tumefaciens*), but to misfits and other accidents during the process of grafting [see also next abstract]. The work is the result of a long series of experiments with Wealthy apple trees of which certain details have been published recently [*R.A.M.*, v, pp. 83, 304].

That such trees do suffer from crown gall is proved by the writers' inoculation experiments, and a special technique for the isolation of the organism from these galls is described. Contrary to expectation, it was found that the bacteria of crown gall apparently do not gain entrance to the plant tissues through the freshly produced unwounded callus of the apple grafts. An account is given of the type of gall produced on apple trees by inoculation with *Bact. tumefaciens*. Both hard and soft galls result, the latter being more frequent. In a few cases roots developed from callus, in the vicinity of such galls, but as regards most of the cases of hairy root mentioned the crown gall organism was not a factor in their development.

Proof of the view that most of these overgrowths are non-parasitic was provided by the study of malformations on 407 apple trees received as crown gall suspects from various growers in different States. Of these, 86 per cent. failed to reveal the presence of *Bact. tumefaciens* or any similar organism when subjected to the above-mentioned standardized technique, though this technique gives positive results in over 70 per cent. of attempted isolations from typical crown galls. The apparently non-parasitic growths

possessed characters which were different from typical crown gall tumours, and the differences are discussed in detail. Such malformations are termed wound overgrowths.

It is shown that wound overgrowths arise as a result of misfits in grafting, or of wounds. On budded apple trees such swellings can arise through some mechanical injury induced in cultivation. Examination of representative lots of commercial apple grafts showed a sufficient number of misfits to account for most of the wound overgrowths which develop in the nurseries.

That *Bact. tumefaciens* is not instrumental in the formation of these wound overgrowths is further shown by the fact that similar growths were produced experimentally, under conditions in which precautions were taken to exclude this organism. It was again seen in these experiments that swellings were formed only when stock and scion failed to fit properly, or when wounding occurred, and that properly fitting grafts resulted in smooth unions.

The control of wound overgrowths, the writers point out, obviously depends on the careful fitting of stock and scion, instead of the very rapid and consequently careless work which is reported practically everywhere. In three nurseries the trouble has been satisfactorily controlled by suitable grafting methods. Tight wrapping with a material which forms a sufficiently strong bandage about the union and maintains its strength throughout the critical period for callusing but rots before an injurious girdling takes place is another important factor in the prevention of wound overgrowths. Wax and certain antiseptics are shown to act as convenient preservatives for the wrappers employed in grafting, and so serve as indirect agents in the control of wound overgrowths. Finally, all mechanical injuries are to be avoided as a matter of course.

MELHUS (I. E.). **Crown gall of Apple nursery stock.**—*Journ. Econ. Entomol.*, xix, 2, pp. 356–365, 1926.

After briefly summarizing the present position of research on crown gall (*Bacterium tumefaciens*) of apple, the author states that, in his own laboratory, 282 isolations from 111 root-grafted trees yielded the crown gall organism only 7 times [see preceding abstract]. Furthermore, outgrowths, morphologically like those occurring on apple nursery stock, were obtained on grafts made under aseptic conditions and grown in sterilized soil. In one lot of specially selected trees, however, 72 per cent. yielded *Bact. tumefaciens*, indicating that the disease can, to a considerable extent, be distinguished from other malformations. The hairy root condition characteristic of crown gall is not always due to *Bact. tumefaciens* [*R.A.M.*, v, p. 494], and in the past, non-pathogenic hairy root has no doubt been confused with the real pathogenic condition. The fact, however, that this organism can produce hairy root is said to be easily demonstrated. It has been observed that 'knot' is much less prevalent on budded than on grafted stock. The reduction of water flow in 'knotted' trees [ibid., iv, p. 234] is thought to be due to lack of complete continuity at the union and the formation of a knot simply an attempt on the part of the tree to make this contact.

The evidence shows clearly that *Bact. tumefaciens* is only one of the less important agents inducing galls and hairy roots, which are due for the most part to inherent tendency of the variety and faulty cultural practices, coupled with conducive environmental conditions.

BRIGGS (F. N.). **Seed treatments for the control of bunt of Wheat.**—*Phytopath.*, xvi, 11, pp. 829–842, 1926.

This paper gives the results of various seed treatments, both liquid and powder, for the control of bunt of wheat (*Tilletia tritici*). The experiments were carried out at Davis, California, and covered a period of four years, starting in 1922. Of the liquid fungicides tried, all gave satisfactory results except furfural which was subsequently rejected. The most successful were 0·1 and 0·2 per cent. solutions of chlorophol (a chlorphenol-mercury compound); corona No. 620, 0·2 per cent.; semesan, 0·2 per cent.; germisan, 0·1 to 0·3 per cent.; and Dupont No. 12, 0·2 per cent. Uspulun 0·1 and 0·2 per cent. was a little less effective than the others. The above fungicides were found to have no adverse effect on the germination of the seed, while copper sulphate and formaldehyde caused considerable seed injury. As regards dust treatments, corona dust, chlorophol, S.D. No. 3, S.D. No. 5, Dupont No. 2, and semesan were found to be as effective as copper carbonate in the control of the disease. Coppercarb, a copper compound with less than half the copper content of copper carbonate, produced fairly good results except that about twice as much as the latter by weight per bushel is required. S.D. No. 5 produced slightly better results than copper carbonate. The writer concludes, that all factors considered, the most satisfactory disinfectant for bunt in wheat is still copper carbonate.

JØRSTAD (I.) & CHRISTIE (W.). **Forsøk i årene 1924 og 1925 med varmtvannsavsopning av Vårhvete mot stinksot.** [Experiments in the years 1924 and 1925 in the hot water treatment of spring Wheat against bunt.]—Reprinted from *Meld. Norges Landbrukshøiskole*, 32 pp., 3 graphs, 1926.

The writers describe and tabulate the results of a series of experiments in the control of bunt of spring wheat (*Tilletia tritici*) by immersion in hot water for varying periods. The tests were carried out with Dinesen's apparatus, which enables an even temperature to be maintained for twenty minutes.

Rapidity of germination was uniformly reduced by the treatment, this effect becoming slowly more noticeable with a rise in temperature. Germination was seriously impaired in the lot of seed-grain used in 1924, the germination percentage of which was comparatively low (90 per cent.), and one of the 1925 lots, with a germination percentage of 97 per cent., also suffered to some extent. Generally speaking, the damage was considerably greater at 51° C. than at 50° or below, whereas a protraction of the period of immersion had little apparent effect on germination. The germinative capacity of light seeds was considerably more reduced by treatment at relatively high temperatures than that of heavier ones.

Drying with hot air (50° to 60°) before or after treatment had no perceptible effect on germination.

In the 1924 experiments the number of hard seeds (i. e., those which failed to germinate in 20 days) was increased by the hot water treatment, especially at 51° and 52°, while there was also a slight rise in the percentage of weak or abnormal germination.

The incidence of infection was generally reduced by an increase in the temperature of the water within the limits tested and in the duration of immersion. This was not uniformly the case, however, treatment for 20 minutes having been no more efficacious than for 15 minutes. Ten to 15 minutes' immersion at 50° to 51° after presoaking gave complete control of bunt in the heavily infected (45 per cent.) lot of seed-grain in 1924 but was only partially effective in 1925.

The conclusion reached as a result of these trials is that the hot water treatment involves considerable risk to the seed-grain and should in no case be used for poorly germinating lots. Where this method is adopted the temperature of the water should be 50° to 51° and the period of immersion ten minutes.

MÜLLER-WIENER. **Erfahrungen mit der Trockenbeize des Saatguts.** [Experiments in seed-grain dusting.]—*Pflanzenbau*, iii, 10, pp. 152–154, 1926.

In 1925 the writer conducted a series of experiments at Derneburg, near Hanover, to test the effect on germination and incidence of infection of uspulun, höchst, tutan, abavit, 998, and 225 dusts [*R.A.M.*, vi, pp. 12, 24] applied at the rate of 150 gm. per 50 kg. of wheat seed-grain for the control of bunt [*Tilletia tritici* and *T. levis*].

Germinative energy was somewhat reduced by 998 and tutan, but was stimulated by all the other dusts, especially uspulun. A fortnight after sowing, however, all the treated seedlings were superior to those in the untreated and artificially infected plots, particularly those from seed dusted with uspulun. The incidence of infection was reduced from 74·4 per cent. in the artificially infected plot to a trace by all the preparations except uspulun, in which the amount was 5·46 per cent. The results of these experiments are regarded as eminently satisfactory, except in the case of uspulun (which may shortly be superseded on the market by höchst), and in general the future of dusting is thought to be assured.

HYNES (H. J.). **Studies on the reaction to stem rust in a cross between Federation Wheat and Khapli emmer, with notes on the fertility of the hybrid types.**—*Phytopath.*, xvi, 11, pp. 809–827, 4 pl., 1926.

In 1921 a successful cross between Federation wheat (*Triticum vulgare*) and Khapli emmer (*T. dicoccum*) was made at Sydney University, Australia. The four F_1 plants thus obtained showed characters of intermediate type, and were partially sterile. In the F_2 generation, plants appeared of vulgare, emmer, durum, and intermediate types. These showed all variations between complete fertility and complete sterility. As regards rust attack, attention was first

confined to the reaction of the hybrids to two strains of *Puccinia graminis tritici*, forms 15 and 27, both obtained in India. Of the parents, Federation was found to be very susceptible to both forms while Khapli was immune, as it is from all known forms of this rust. In the F_3 generation, 30 families were inoculated with the two strains and their susceptibility recorded. Some F_3 families showed all gradations between complete susceptibility and complete resistance, and the inheritance of resistance and susceptibility is interpreted on a multiple factor hypothesis. Data arranged in tables show that one family appeared homozygous for susceptibility to form 27, but none were homozygous for resistance to either form. The remainder of the families were heterozygous with either resistance or susceptibility dominant or in some cases neither dominant. Combining the data obtained from experiments with the two strains, one family was found to be heterozygous in reaction to both strains with resistance dominant. Breeding from some of the F_2 plants it was found that the durum types of this generation bred true while most of the F_2 intermediate and emmer types segregated in the F_3 generation. Variations in fertility between 0 and 85 per cent. occurred.

The progeny of some of the F_3 plants were tested as to their reaction to 13 forms of rust. Most of the families proved to be susceptible, but some showed a semi-resistant reaction. Similar work using F_5 plants is still in progress.

BAILEY (D. L.) & CRAIGIE (J. H.). **Studies on the epidemiology of Wheat stem rust in Manitoba, 1925.**—Abs. in *Phytopath.*, xvi, 10, p. 755, 1926.

Slides were exposed at intervals during July, August, and September, 1925, on aeroplanes at elevations of 3,000 to 5,000 feet, in Manitoba and Alberta [*R.A.M.*, iii, p. 51]. It was found on correlating the results thus obtained with field observations, that wheat rust [*Puccinia graminis*] spores had been carried by the wind for considerable distances from their place of origin.

NEWTON (MARGARET) & JOHNSON (T.). **Greenhouse experiments on the relative susceptibility of spring Wheat varieties to seven physiologic forms of Wheat stem rust.**—*Scient. Agric.*, vii, 5, pp. 161–165, 1927.

In connexion with the breeding of varieties of common wheat resistant to stem rust (*Puccinia graminis tritici*), the most destructive parasite of wheat in Western Canada, the authors have tested, under greenhouse conditions at the Rust Research Laboratory, Winnipeg, the reaction of 29 varieties of wheat to 7 physiologic forms of the rust (including an apparently new form) which occur most commonly in this region. The results of the tests are tabulated, the symbols indicating the types and degrees of infection being adapted from Stakman and Levine [*R.A.M.*, ii, p. 158]. Of the common wheats McFadden's Emmer, Marquillo, Webster, Sevier × Dicklow, and Marquis × Kanred showed the greatest degree of resistance, but the Marquis × Kanred cross though immune from four of the physiologic forms was susceptible to the remaining three. The new varieties Garnet, Reward, Axminster, Warren,

Quality, and McKenzie's Selection appeared rather susceptible. Of the durum wheats tested, Iumillo and Pentad were highly resistant, but both these varieties and Marquillo appeared to be genetically impure, as although the majority of the plants were resistant to most of the forms a number always appeared susceptible.

NEWTON (MARGARET) & JOHNSON (T.). **Physiologic forms of Wheat stem rust in Western Canada.**—*Scient. Agric.*, vii, 5, pp. 158–161, 1927.

From 1919 to 1925 the authors made collections of stem rust of wheat (*Puccinia graminis tritici*) throughout the wheat-growing areas of Western Canada and by means of inoculations and cultures carried out in the greenhouse, in the manner described by Stakman and Piemeisel (*Journ. Agric. Res.*, x, pp. 429–495, 1917), have succeeded in differentiating 17 physiologic forms of the fungus among their collections. The results [given in tabular form] show no correlation between the number of collections made each season and the number of forms isolated; in 1919 out of 28 collections 9 physiologic forms were isolated whilst in 1925 only 6 occurred in 175 collections. Different physiologic forms were also found to predominate in different years; from 1919 to 1921 form 17 was predominant and form 21 occurred only rarely, but in 1925 form 17 disappeared and form 21 became one of the most prevalent. Other forms may appear or disappear in a similar irregular manner. Nothing in the results obtained so far indicates that the less virulent forms tend to be overcome by the more virulent, and there seems to be no correlation between the virulence of the form and the frequency of its appearance. Form 15, the most virulent in Canada or the United States, appeared but once in Canada in 1919 and its disappearance remains to be explained. Relatively few (from 5 to 10) physiologic forms have been found in Western Canada in any one season. In 1925, for instance, 90 per cent. of the collections were either form 36 or form 21 or a combination of both, and although Canada often suffers severe losses from stem rust only a small number of forms are apparently responsible for the injury.

BAILEY (D. L.) & GREANEY (F. J.). **Field experiments on the control of stem rust by sulphur dust.**—*Scient. Agric.*, vii, 5, pp. 153–156, 1927.

In continuation of their experiments on the control of stem rust of wheat [*Puccinia graminis*] by dusting with sulphur [*R.A.M.*, v, p. 150] the authors describe the results obtained in field trials made during 1926. The season, however, was unfavourable to rust and therefore not satisfactory for the testing of this method of control. Nevertheless in small plot experiments, two or three applications every week had a very noticeable effect in checking such development of the disease as occurred. In the absence of any material amount of rust, the sulphur appeared to have little if any direct influence on the yield.

In a field trial, dusting with sulphur weekly at the rate of 30 lbs. per acre or twice a week at 15 lbs. per acre significantly held the rust in check, whilst the yield was increased from 24·5

bushels to 29·0 and 25·1 bushels per acre, respectively. Similar results were also obtained in another field trial, where in one case the percentage of rust on wheat following potatoes was reduced from 20 to 30 to 5 by weekly applications of 30 lbs. of sulphur to the acre, whilst the yield increased from 39·4 to 44·6 bushels per acre.

STUCH. **Ueber den Einfluss des Meltaubefalls auf die Halmfestigkeit des Getreides bei verschiedener Ernährung (Autoreferat).** [On the influence of mildew infection on the haulm strength of cereals receiving different nutrient substances (Author's abstract).]—*Pflanzenbau*, iii, 6, pp. 93–95, 1 fig., 1926.

The results of recent experiments [particulars of which are given] to test the influence of varying nutrition on the strength of the haulms of wheat and barley plants exposed to infection by mildew [*Erysiphe graminis*] showed that heavy applications of nitrogen increased the liability to mildew, while simultaneously producing a reduction in the thickness of the cell walls and in the strength of the haulm (as measured by the apparatus of Kraus). Excess of phosphoric acid thickened the cell walls and strengthened the haulms but increased susceptibility to mildew. On the other hand, excess of potash reduced the degree of infection and strengthened the haulms by thickening the walls of the sclerenchyma and parenchyma cells. No correlation, therefore, was found between the thickening of the cell membrane and the incidence of mildew.

REED (G. M.). **Further evidence of physiologic races of Oat smuts.**—*Mycologia*, xix, 1, pp. 21–28, 1927.

The writer has continued his investigations on the occurrence of physiologic races in loose and covered smuts of oats (*Ustilago avenae* and *U. levis*) [*R.A.M.*, iv, pp. 27, 731]. In earlier studies strains of Fulghum and Red Rustproof consistently proved highly resistant to both smuts, a behaviour which has been confirmed with further strains. Both varieties are grown extensively in the southern United States and in spite of their high resistance in experimental tests a considerable amount of smut does occur in the southern area. Three collections of loose smut on Fulghum were obtained, therefore, from Tennessee, Oklahoma, and Texas, respectively, and tested on varieties of oats at Brooklyn. The variety Fulghum became severely infected (53·6 to 97·8 per cent.) but the results with Red Rustproof were practically negative (4 smutted plants in 869), whilst Bart also showed high resistance. The three collections severely infected *Avena nuda* var. *inermis* and the varieties Black Diamond, Canadian, and Early Champion of *A. sativa*. Early Gothland, which is very susceptible to the Missouri race of loose smut, was moderately infected (1·3, 47·1, and 37·1 per cent.) while Monarch, a variety very resistant to the Missouri race, was also moderately infected (21·8, 41·3, and 17·8 per cent.). Black Mesdag was not smutted and Markton showed only one doubtful case. Similar tests were made with a collection of loose smut on Red Rustproof from Texas. It was unable to smut Fulghum (one

case in 109 plants) but infected Red Rustproof more or less severely (25·9 to 70·8 per cent.); the results with this race on the other varieties listed were practically negative. The data clearly indicate, therefore, that distinct races of *U. avenae* attack Fulghum and Red Rustproof oats.

The writer's earlier observations had indicated a general similarity in the reaction of cultivated varieties of oats to Missouri strains of the two smuts [*R.A.M.*, v, p. 663]. Exceptions occurred and a further test was made with varieties of seven species of oats. The results, which are tabulated, showed that *A. nuda*, most of the varieties of *A. strigosa*, and the varieties Canadian, Early Champion, and Victor of *A. sativa* are highly susceptible to both species while Black Mesdag, Joanette, Bart, Fulghum, and Red Rustproof are highly resistant to both smuts. Sixteen varieties of *A. sativa* which are susceptible to loose smut proved highly resistant to covered smut. Monarch however, which is very resistant to the Missouri race of loose smut, showed high susceptibility to covered smut. These two smuts therefore can be differentiated by differences in their capacity for infecting certain varieties.

NISIKADO (Y.) & MIYAKE (C.). **Studies on two Helminthosporium diseases of Maize, caused by Helminthosporium turcicum Passerini and Ophiobolus heterostrophus Drechsler (= Helm. maydis Nisikado et Miyake).**—*Ber. Ōhara Inst. Landwirtsch. Forsch.*, iii, 2, pp. 221–266, 6 pl., 3 graphs, 1926.

The present paper is a detailed account of maize blight (*Helminthosporium turcicum*) and spot disease (*H. maydis* Nisikado & Miyake), and for the most part reproduces the information contained in the authors' former report which has already been noticed from another source [*R.A.M.*, v, p. 734]. Since the publication of the latter, the authors have established that their *H. maydis* is identical with the conidial stage of Drechsler's earlier *Ophiobolus heterostrophus* [ibid., p. 293], of which it is therefore considered to be a synonym. In addition to the inoculation experiments previously described, 25 species and two varieties belonging to 21 genera of Gramineae were inoculated with *H. maydis*, and of these *Zea mays* and *Setaria glauca* were found to be susceptible, *Imperata arundinacea*, *Phalaris arundinacea* var. *genuina*, and *S. italica* slightly or doubtfully susceptible, and all the others immune or extremely resistant to the fungus.

REDDY (C. S.), HOLBERT (J. R.), & ERWIN (A. T.). **Seed treatments for Sweet-Corn diseases.**—*Journ. Agric. Res.*, xxxiii, 8, pp. 769–779, 4 graphs, 1926.

This is an account of extensive field experiments carried out in 1925, partly near Bloomington, Illinois, and partly at Ames, Iowa, with a view to testing the value of several organic mercury compounds [a list of which is given] for the control of seed-borne diseases of sweet maize, namely, *Diplodia zeae*, *Gibberella saubinetii*, and bacterial blight, *Aplanobacter stewarti* [*R.A.M.*, iii, p. 450; iv, p. 162]. The results indicate that seed treatment with any of these compounds largely prevents both fungus diseases, but

not the bacterial one (which is stated to be very destructive to sweet maize), and does not injure the seed. When seed infected with *D. zeae* or *G. saubinetii* was used, the field stands and yields were almost always materially increased by the treatment. The yields from nearly disease-free seed were slightly higher than those from treated *Diplodia*-infected seed, and considerably higher than those from treated seed infected with *Gibberella*. It is pointed out, however, that this treatment cannot satisfactorily replace the methods now in use for breeding improved sweet maize, and can be of financial advantage only in those years when it is practically impossible to obtain seed that is not heavily infected with the above diseases.

VIBAR (T.). **The relation of temperature and moisture to diseased and disease-free Corn.**—*Philipp. Journ. of Science*, xxxi, 2, pp. 169–213, 11 figs., 1926.

In order to obtain evidence on the interrelation between certain environmental factors and the effects of fungal infection in maize grains as determined by dissection or by germinating in a seed germinator, two sets of experiments, in the laboratory and in the field, were carried out at the University of Illinois from 1921 to 1923. In the laboratory tests, only kernels infected with *Diplodia zeae* were used, while in the field tests the organisms or diseases concerned were *D. zeae*, *Fusarium moniliforme* [*Gibberella moniliformis*], and scutellum rot [*R.A.M.*, v, p. 225]. In this paper the effect of temperature and moisture on the diseased and disease-free kernels is discussed, the other parts of the work being reserved for future publication.

Infection by *D. zeae* generally takes place through the tip of the ear, and the kernels from the upper part of diseased ears may be infected when those at the base are sound. Infected kernels give a low percentage of germination, and such seedlings as were produced were very irregular in growth and frequently succumbed at various stages of growth. The severity of the damage appears to depend on the degree of initial infection, other conditions being equal. Those that survive the early effects generally give normal plants.

The effect of temperature on the growth of the surviving seedlings was the same whether the seed was diseased or disease-free, but the severity of the attack by *D. zeae* increased with a rise in temperature so that the stand was reduced more and more as the temperature of germination increased. The cardinal temperatures for the mycelial growth of this fungus are apparently about the same as those for the growth of maize or somewhat wider. The susceptibility of the host plant also increases with a rise in temperature and the same was observed in regard to infection by *Ustilago zeae*. *D. zeae* in general proved a more virulent parasite than *F. moniliforme*.

The effect of increasing moisture was to increase the growth of the mycelium of *D. zeae* within certain limits, but the growth of seedlings from kernels affected with the different diseases or free from disease was similar under each set of conditions tested.

In general it is concluded that the relationship of temperature

and moisture to the growth of maize from diseased and disease-free kernels follows the law of limiting factors.

ELENEFF (P. F.). **Wirtschaftliche Kampfmassnahmen gegen das Verdursten des Wintergetreides.** [Agricultural measures for the control of winter injury to autumn sown cereals.]—*Pflanzenbau*, iii, 13, pp. 204–205, 1927.

This is a literal translation into the German language of the author's paper already noticed from another source [*R.A.M.*, v, p. 542].

RHOADS (A. S.). **A new method for treating foot rot.**—*Amer. Fruit Grower*, xlvi, 11, pp. 7, 24, 2 figs., 1926.

During the autumn of 1925 the writer studied a new method for the control of foot rot of citrus [*Phytophthora parasitica*: *R.A.M.*, ii, p. 542] at Umatilla, Florida. Instead of the usual practice of exposing the diseased root crowns to air and sunlight, the bases of the infected orange trees were banked with clay several years ago to stimulate the development of a new root system. A rough box, large enough to hold about two wagon loads of clay, was constructed round the base of each tree. During the period following the banking, a number of healthy roots developed from the margin of the callus formed above the girdled trunk.

WOLF (F. A.). **The perfect stage of the fungus which causes melanose of Citrus.**—*Journ. Agric. Res.*, xxxiii, 7, pp. 621–625, 2 figs., 1926.

The discovery in Florida of the ascogenous stage of *Phomopsis citri* Fawc., the cause of stem-end rot and melanose of citrus in that State, is recorded. In July 1925 a species of *Diaporthe* was found on decaying twigs of lime (*Citrus aurantifolia*) at Orlando, and a month or two later it was observed again on twigs of grapefruit, sweet orange (*C. sinensis*), and tangerine (*C. nobilis*) in other localities. In September bundles of affected twigs bearing pycnidia of the *Phomopsis* were left to lie on the soil in a sheltered place and mature perithecia of the *Diaporthe* were found on them at the end of January, indicating that the perfect stage can develop on fallen twigs at any time of the year. Pure cultures were obtained readily from the ascospores by inverting dishes containing agar media over twigs lying on damp blotting-paper, the ascospores being ejected on to the surface of the media. The cultures were inoculated on sterile stems of pigeon pea [*Cajanus indicus*] and pycnidia containing both the functional conidia and the stylospores of *Phomopsis* developed in three to four weeks. Comparison with the pycnidia and spores developed in the same substratum from isolations from stem-end rotted fruits showed that they were similar in every respect. Inoculations were made on sweet orange and grapefruit seedlings and on young flushes of large grapefruit trees by placing on young leaves and shoots swabs of cotton-wool moistened with suspensions of the conidia from sterilized pigeon-pea stems which had been inoculated with mycelium derived from ascospores. Infection followed in about a week and in 12 to 14 days typical melanose lesions had developed on all inoculated parts. A fruit rot of

mature oranges was induced also by puncture inoculations with conidia of the same origin. The perithecia with long, black, slender beaks are borne singly or in groups in a stroma which remains immersed in the bark at maturity; they are 125 to 160 μ in diameter and the beaks 200 to 800 μ in length and from 40 to 60 μ in width; the sessile, clavate asci, which have a thickened apex, measure 50 to 55 by 9 to 10 μ, while the hyaline, two-celled, elliptical or fusiform ascospores vary from 11·5 to 14·2 by 3·2 to 4·5 μ. A technical description in English of both the ascogenous and pycnidial stages of the fungus is given under the binomial *Diaporthe citri* (Fawc.) Wolf.

The beaked perithecia of another fungus, *Eutypella citricola* Speg., were found occasionally interspersed with those of the *Diaporthe* on citrus twigs.

BATHELLIER (J.). **Note sur la maladie des Aréquiers de Ha-Tinh.** [Note on the disease of the Areca palm in Ha-Tinh.]—*Bull. Écon. de l'Indochine*, N.S., xxix (*1926*), 178, pp. 159–165, 1 fig., 1926.

The present note is the outcome of a survey made by the author in 1925 of the areca palm [*Areca catechu*] plantations in the provinces of Vinh and Ha-Tinh [Annam], following reports of a disease which is decimating the trees. The cultivation of the areca palm is centralized chiefly in three contiguous regions occupying the valleys of the river Song-Ca and of two of its tributaries, and the whole of these areas are stated to be heavily infected. In every case the infection appears to have started in the upper reaches of the rivers and to have spread down-stream.

The first symptom of the disease in a plantation is that some groups of otherwise normal trees shed their flowers and cease producing fruit. At the same time the terminal bud becomes atrophied. The leaves produced are shortened and are borne at abnormally long distances from each other; such leaves are usually invaded by fungi which cover them with spots and destroy their apices. Investigation indicated that infection occurs through the tips of the finest root ramifications, which rot; it then advances through the main roots into the trunk, the central portion of which assumes a pinkish discoloration, becomes of a soft consistency, and emits a peculiar odour. In the affected roots the cambium is reduced to a semi-liquid, pus-like matter filling the space between the wood cylinder and the cortex.

An histological examination of the terminal bud and of the leaves from obviously affected trees, even at advanced stages of the disease, failed to reveal the presence of any parasitic organisms, but sections of diseased roots showed the constant presence of a species of *Micrococcus*, 0·3 to 0·5 μ in diameter, which is believed to be the causal agent of the disease, although its pathogenicity was not tested by artificial inoculations.

Apart from purely agricultural measures, such as good aeration of the soil by tillage, application of artificial manures, e. g., kainit or calcium cyanamide, and the eradication of the diseased trees, the author considers that the disease might best be controlled by the selection of resistant strains of the areca palm, the more so, since

local growers state that the variety with mauve-coloured stems exhibits marked resistance as compared with the white-stemmed variety.

ALTSON (R. A.). **The occurrence of Sclerotium disease of Coffee in the North-west district.**—British Guiana, Combined Court No. 32/1926, Georgetown, Printers to Government, 5 pp., 1926.

The author reports the discovery of the sclerotium disease of coffee (*Sclerotium coffeicolum*) [*R.A.M.*, i, p. 14] in the North-west District of British Guiana where there are about 1,400 acres under *Coffea liberica*. The disease was not previously known to occur in the colony, although it was ascertained that it has been present for some 10 or 12 years, and there is thought to be no doubt that it is the disease referred to by Bancroft in the Report of the Department of Science and Agriculture for 1914–15, under the name of anthracnose. It has also recently been observed in Trinidad [*R.A.M.*, v, p. 737].

Not less than 25 to 30 per cent. of the crop in the affected area as a whole is being destroyed by the disease, the greatest damage being caused by the infection of the berries, which wither up and fall to the ground. It is not uncommon to find trees on which some 80 per cent. of the fruit has been killed in this manner. In addition, crop production is lowered by the destruction of flowers and flower cushions and by the general weakening of the tree resulting from severe leaf infection.

The widespread distribution of the disease is attributed to the heavy mists which occur in the early morning during the dry weather over the whole of this coffee-growing district, and enable the fungus to develop more or less freely throughout the year. A humid atmosphere is not only necessary for infection, but also for the continued development of the fungus, the attack being heaviest on lands bordering the water side, especially in the neighbourhood of the Barima River.

The presence of sclerotium disease in the district is not only a menace to the existing industry, but is likely to act as a deterrent to future development, and a determined effort should, in the writer's opinion, be made to bring it under control.

Spraying with 2 per cent. Bordeaux mixture is stated to have given good results in Surinam, but the cost of spraying under the conditions prevailing in the North-west District of British Guiana, where the individual plantations are mostly small, is regarded as prohibitive. A Government grant in aid is therefore suggested.

The author carried out experimental spraying in order to secure information as to cost, using a 2 per cent. Bordeaux mixture and a 'Four Oaks' external pattern knapsack sprayer. It was found that about 160 galls. of spray fluid per acre were required and that about two-thirds of an acre could be covered by one machine in a working day. He estimates the cost at $4·72 per acre.

JONES (G. H.) & MASON (T. G.). **On two obscure diseases of Cotton.**—*Ann. of Botany*, xl, 160, pp. 759–772, 1 pl., 6 figs., 1926.

A detailed account is given of two rather obscure diseases of

cotton which occur in Nigeria. The first, for which the name 'leaf curl', proposed in 1912 by Farquharson, is retained, is especially prevalent on the native-grown species of cotton (*Gossypium peruvianum* and *G. vitifolium*), but may also attack American cotton (*G. hirsutum*). It was first described from south-east Nigeria; in 1924 it was found to be common in the Oyo and Abeokuta provinces of south-west Nigeria, and specimens were also received from northern Nigeria, showing that it occurs throughout the colony; it is believed that it probably occurs also in the Anglo-Egyptian Sudan.

The histological modifications that characterize this disease strongly resemble those that accompany virus diseases in other plants. In affected native cotton plants the leaves show a strong upward curve of their margins; they are thicker and more brittle than normal, and emit a rattling sound when the plant is shaken. The most characteristic feature of the disease is the presence on the under side of the leaves of enations which may arise at any stage in the development of the leaf or of the plant. In slightly affected leaves they appear as minute outgrowths at a few points on the smaller veins, but in severe cases as a regular swelling along the main and secondary veins. Not infrequently these enations give rise to minute foliar structures, which may attain ½ cm. in breadth. The upper surface of the leaf is usually normal, but occasionally slightly mamillated. The colour of the affected leaves is usually darker than normal, but it also may be mottled to a chlorotic and dark green mosaic. In severe cases the bracts also may bear net-vein enations, but no other abnormalities have been found in other parts of the plant. In American cotton the internodes are shortened, giving the plant a 'bunchy top' aspect; the affected leaves are greatly stunted and distorted by blisters, while the colour is 'savoyed' to a light and dark green. In rare cases enations in the form of minute foliar growths may occur on the upper (not the under) side of the leaf. American cotton plants affected by the disease are strongly reminiscent of Cook's figures of stenosis in cotton [*R.A.M.*, iv, p. 166; see also iii, p. 272]. Under the microscope the diseased leaves show an elongation of their palisade cells, while their spongy mesophyll is more bulky and irregular than in normal leaves. No signs of phloem necrosis or of starch accumulation were found in diseased plants.

Artificial infection experiments showed that the disease may be transmitted by grafting dormant buds from diseased plants on healthy stocks, the symptoms being reproduced not only in the leaves arising from the graft, but also in the leaves that develop later, on shoots from the stock. Attempts to transmit the disease by inoculation with the sap of affected plants, or by jassids, failed to give positive results. In discussing the effect of environment, it is pointed out that while no marked place effect was noted, the incidence of leaf curl appears to be particularly high in the spring, under very humid conditions, and when jassids are very numerous in the fields.

The symptoms of the second disease, for which the name 'leaf roll' is suggested, have already been described in Mason and Wright's paper [*R.A.M.*, v, p. 423]. It occurs chiefly on American

cotton, though the native species are also occasionally affected. The authors' investigations have confirmed the statement that this disease is not infectious, the most important predisposing environmental factor being excessive soil humidity as such (and not its indirect effects, e. g., root asphyxiation, leaching of solutes, and the like). The disease was not noticed in plants growing under heavy shade, and the general experience is that diseased plants recover and produce healthy foliage on the onset of dry conditions.

MARSH (R. W.). **Inoculation experiments with Nematospora gossypii, Ashby and Nowell.**—*Ann. of Botany*, xl, 160, pp. 883–889, 1926.

In continuation of his previous paper [*R.A.M.*, v, p. 92] recording the presence in a sample of diseased seed cotton from Nyasaland of a species of *Nematospora*, since identified by Ashby and Nowell as *N. gossypii* [ibid., p. 389], the author describes his experiments, made in 1925 at Manchester University, in which he inoculated the bolls of eight named varieties of cotton with the organism. The results established that the latter is unable to attack unpunctured bolls or to cause injury to mature cotton hairs, and that it has no power of destroying cellulose under experimental conditions. In developing lint it appears to interfere with the growth and maturing of the hairs, this effect being marked by staining, arrested development, and, probably, the premature death of the hairs. Staining appears to be purely a reaction of the living hairs, as it was demonstrated that other organisms, either saprophytic fungi or bacteria, may produce the same effect; it is pointed out, however, that physical means failed to give conclusive results in this respect.

A small number of cotton bolls were also inoculated with pure cultures of *N. coryli* and *Spermophthora gossypii* [loc. cit.], and the effect of these organisms on the developing lint was found to be similar in all respects to that produced by *N. gossypii*.

MAHDIHASSAN (S.). **Lac secretion and symbiotic fungi.**—Reprinted from Studies in bio-chemistry, Bangalore [India], 4 pp., 1923. [Abs. in *Centralbl. für Bakt.*, Ab. 2, lxix, 1–7, pp. 97–98, 1926.]

The Indian stick-lac producing insects have been referred by the author to the genus *Lakshadia* Mahdih. All the species of this genus are associated with a symbiotic fungus which the author places near *Monilia nigra* Brown [according to Berkhout probably the same as *M. nigra* Burri & Staub., now called *Torula dematium* Berkh.]. Of the two lac-insects of Ceylon, *Tacchardia albizziae* has as a symbiont a fungus closely allied to *Monilia candida* [presumably *M. candida* of Hansen now *Candida vulgaris* Berkh.], and *Metatacchardia conchiferata* is associated with an Actinomycete. Of the two so-called pseudolac-insects of Mysore, India, *Tacchardina lobata* is associated with a fungus referred to *Atelosaccharomyces*, and *T. silvestrii* with a fungus referred to *Nocardia* [*Actinomyces*].

RAFF (E.). **Die pilzlichen und tierischen Feinde des Chrysanthemum. Ihr Auftreten und ihre Bekämpfung.** [Fungus and insect enemies of the Chrysanthemum. Their occurrence and control.]—*Gartenwelt*, xxx, 50, pp. 782–784, 1926.

The author discusses in popular terms some common diseases of chrysanthemums. Mildew (*Oidium chrysanthemi*) is favoured by lack of ventilation and overwatering, but can be controlled by dusting with naphtha sulphur or spraying with 1 per cent. solbar; leaf spot (*Septoria chrysanthemi*) attacks overcrowded plants and particularly certain varieties, e. g., William Turner; rust (*Puccinia chrysanthemi*) is a serious disease on many varieties, including the popular H. E. Converse. Both leaf spot and rust can be treated by applications of 2 per cent. Bordeaux mixture. A yellowing [Gelbsucht] of the leaves of the Queen Mary variety, thought to be due to a fungus, occurs frequently in the north of Germany but only occasionally in the south. No remedy for this disease has been found, but care should be taken that plants are only propagated from healthy stock.

ZÖPPIG (F.). **Die Schädlinge und Krankheiten unserer Alpenveilchen (Zyklamen) und ihre Bekämpfung.** [The pests and diseases of our Alpine Violets (Cyclamen) and their control.]—*Die Kranke Pflanze*, iii, 11, pp. 202–205, 1926.

Brief, popular notes are given on the effects of attack by the following fungi on cyclamens in Germany, with concise directions for control: *Moniliopsis aderholdi*, *Thielavia basicola*, *Botrytis cinerea*, *Septoria cyclaminis*, *Phoma cyclameneae*, and *Colletotrichum cyclameneae*.

LANDGRAF (T.). **Der gelbe Rotz der Hyazinthen.** [The yellow rot of the Hyacinth.]—*Gartenwelt*, xxx, 48, p. 758, 1926.

This is a brief, popular account of the yellow rot of hyacinths (*Bacterium* [*Bacillus*] *hyacinthi*) [*R.A.M.*, iv, p. 544], which is stated to be again threatening the cultivation of these plants in the neighbourhood of Hamburg owing to the wet weather which prevailed in 1926. Recommendations made for the control of the disease include the immediate destruction of all infected bulbs, the storage of the dormant bulbs under dry and well aerated conditions, planting as superficially as possible, and dusting them with powdered charcoal before planting.

JONES (F. R.) & MCCULLOCH (LUCIA). **A bacterial wilt and root rot of Alfalfa caused by Aplanobacter insidiosum L.McC.**—*Journ. Agric. Res.*, xxxiii, 6, pp. 493–521, 6 pl., 1926.

In this paper a full description is given of the bacterial wilt of lucerne (*Medicago sativa*) caused by *Aplanobacter insidiosum* [*R.A.M.*, v, p. 36], which is stated to be a most serious and threatening disease in some of the irrigated and more humid areas of the United States. Up to the present it has been recorded in many localities from New Jersey to Idaho and south to Mississippi. So far it has not been found on seedlings or young plants, but only in three-year-old or older fields.

The disease has undoubtedly been present for a long time, but has usually been ascribed to winter injury or to nematodes. The root rot described by Durrell and Sackett in Colorado [*R.A.M.*, iv, p. 740] is thought to be identical, though the brief account of its presumed causal organism does not agree with the characters of *A. insidiosum*.

Nearly all the badly diseased non-irrigated fields hitherto observed have occurred in districts with a rainfall of 30 to 40 inches. Infection generally follows the lines of drainage in the fields, but where these are not definite it is more or less uniformly distributed. It appears to be more abundant where the soil is retentive of moisture.

The organism occurs chiefly in the vessels, the bacteria passing from the tap-root to each succeeding weakened crop of stems until the plant is killed. The chief symptoms produced are a dwarfing and yellowing of severely diseased plants, bleaching of the foliage, and a yellow or brown discoloration in the outer part of the woody cylinder of the tap-root which is readily observed when the latter is cut.

Direct inoculation of lucerne plants with pure cultures has been successful only through wounds, the parasite entering either directly into the vascular system through cut stems, or into the cortical tissue of the roots whence it makes its way into the vessels. This vascular invasion, which fills the vessels with a pale yellow mass becoming darker and gummy with age, may extend to the veins of the leaves, but the organism has not yet been demonstrated in the seed. Recently infected vessels show no unusual symptoms except the presence of the bacteria.

Owing to the slow and uncertain growth of *A. insidiosum*, isolation is somewhat difficult. The colonies in poured plates are seldom visible before the fifth day and may not appear for 13 days. On solid media the growth is yellow, but this colour is usually soon obscured by the formation of small blue particles which change the colour to bluish-green or blue. The bacteria grow best at 23° C., and prefer a medium containing potato or sugar. Growth can occur at 1° and the bacteria make some progress in filling vessels in the tap-root at 9°. Symptoms of disease and the death of infected plants appear to be hastened by retardation of root growth brought about by high soil temperature or frequent cutting of the crop.

The viability of the organism in the soil after a diseased field has been ploughed has not been determined, but it has been isolated from five-month-old lucerne hay which was kept in a dry atmosphere.

Until more is known of the life-history of *A. insidiosum*, no control measures beyond attention to soil drainage in irrigated fields can be recommended. In one instance the most rapid distribution of the disease seemed to be in the direction taken by the mower across a diseased strip. Spreading by the mower will undoubtedly be greatly lessened if fields are cut only when they are dry.

The same organism has been found producing a wilt disease of *Melilotus alba* in Wisconsin.

SMITH (A. J. M.). **Bitter pit in Apples. A review of the problem.** —*Dept. Sci. & Indus. Res. Food Invest. Board, Special Rept.* 28, iv + 24 pp., 2 pl., 4 graphs, 1926.

After describing briefly the characteristic symptoms of the bitter pit disease of apples, the author critically reviews in some detail the theories that have been put forward to account for the phenomenon, which is almost universally held to be functional and not parasitic. The theory of local poisoning first suggested by White (*Proc. Roy. Soc. Victoria*, xxiv, N.S., pp. 1–16, 1911) and strenuously supported by Ewart (ibid., 1913, 1914, 1917) is regarded as a possibility but without any strong evidence in its favour. Local desiccation theories [*R.A.M.*, iii, p. 584] appear to neglect the possibilities of water conduction between adjacent cells of the apple pulp, and the author considers that drying-out of the cells is the result and not the cause of death. The theory of cell rupture by root pressure is regarded as being based on the misconception that cells can be inflated with water by mechanical pressure, whereas a cell can only take in water until its osmotic pressure is balanced by the tensions set up in the cell as a result of its elastic stretching. The theory of asphyxiation suggested by Kidd and West on the basis of the similarity in appearance between bitter pit and certain forms of artificially produced brown heart [*R.A.M.*, iii, p. 145] is open to the objections that diurnal temperature fluctuations, which it was thought might result in a toxic concentration of carbon dioxide in the tissues of the apple at the lower night temperature, do not appear to play so great a part as varietal differences, the age of the tree, or even soil conditions while the spread of bitter pit in storage is in marked contrast with the arrest of brown heart development.

A survey of the published data regarding the influence of orchard factors showed that severe pruning and heavy irrigation towards the end of the season predispose to bitter pit, indicating that water relations are concerned in some way with the disease.

In certain varieties bitter pit appears while the fruit is on the tree, in others it may develop rapidly after picking. There is, however, no definite information whether bitter pit invariably originates on the tree or whether sometimes it may develop *de novo* in storage. Orchard practices, which prevent bitter pit to some extent, may not actually control the cause of the disease but merely influence the susceptibility of the fruit.

In a series of experiments made with Ribston Pippins and Cox's Orange Pippins grown in Tasmania the percentage of bitter pit at second picking was much less than that present on the same date in stored fruit of the first picking, and even after five months fruit of the second picking still showed a much smaller percentage than that of the first picking. Cold storage has been found to retard the development of bitter pit in some varieties which characteristically develop the disease in storage, but contradictory results were obtained in other cases. This retarding effect where present is apparently reduced by a delay in storing.

The commercial importance of the disease centres in its development in fruit during transit overseas, and the author suggests

tentatively that later picking with more rapid refrigeration may be found to give favourable results.

A bibliography of 32 titles is appended.

ZELLER (S. M.). **Cankers of Apple and Pear in Oregon and their control.**—*Oregon Agric. Exper. Stat. Circ.* 73, 29 pp., 28 figs., 1926.

Cankers of various sorts take each year a heavy toll of fruiting wood from the apple and pear orchards of Oregon. Those caused by parasitic organisms leave openings for the entrance of wood-rotting fungi and may in time girdle and kill large branches and whole trees. Ten different kinds of canker have been detected in the State, the most injurious being apple-tree anthracnose (*Neofabraea malicorticis*), perennial canker (*Gloeosporium perennans*), frost cankers, fire blight (*Bacillus amylovorus*), European canker (*Nectria galligena*), and heart-rot canker (usually *Polystictus versicolor*). The cankers due to *Physalospora malorum* [*P. cydoniae*], *Cytospora* spp., *Myxosporium corticolum*, and *N. cinnabarina* cause only minor injury under Oregon conditions. A key is furnished for the identification of cankers, and is followed by an account of the symptoms, injury, and treatment of each kind. Anthracnose may be prevented by one summer spray of 4–4–50 Bordeaux mixture thoroughly applied. No satisfactory means of preventing perennial canker is yet known, but a spring application of Bordeaux mixture combined with the oil spray for leaf roller appears to be of some assistance. The only successful way of controlling fire blight is to cut out and burn all diseased parts and to disinfect the wounds with a solution of 1 part of mercuric cyanide and 1 part of mercuric chloride in 500 parts of water, in which the pruning tools must also be dipped after each cut. European canker can be controlled by painting winter injured bark, by cutting out open and closed cankers, and by scraping off the superficial first-year cankers on the pear. The number of new infections is materially reduced by an application of 4–4–50 Bordeaux mixture before the autumn rains.

The writer distinguishes between wound dressings which are 'air tight' (asphalts, lead paints, and grafting waxes) and those that are 'air porous' (carbolineums, Bordeaux paste, and paint). Air porous dressings are to be preferred in western Oregon as the sap pressure in winter tends to rupture air-tight coverings and allow of infection by wood-rotting fungi. Bordeaux paint is a very good permanent dressing (effective for at least 4 years); it is prepared by stirring raw linseed oil into one of the commercial Bordeaux dusts until a thick smooth paint is formed; it is applied with a brush and brushed out to a thin coat.

FOLSOM (D.). **Apple spraying and dusting experiments in 1925.**—*Maine Agric. Exper. Stat. Bull.* 333, pp. 145–204, 8 pl., 1926.

Spraying and dusting tests with fungicides against apple scab (*Venturia inaequalis*) were carried out in 1925 at the Highmoor Farm, Monmouth, Maine, in continuation of those previously reported [*R.A.M.*, v, p. 369]. Observations were also made as to the development of scab in storage, under various conditions.

The effect of seasonal variations on the severity of scab makes several years' tests necessary for reliable conclusions. If it were known what natural conditions cause these variations it might be possible to adapt the spraying programme to the needs of the season. The lack of uniformity in the development of buds and fruit on the various trees, however, also appears to affect fungicidal treatment, resulting in greater or less russeting or in more rapid growth or attenuation of the protective covering immediately following application, with consequent greater scab infection before the calyx application can be applied. In 1925, the first scab infection from the mature ascospores occurred from 15th to 19th May, indicating the date for the pink application. Spread by the conidia took place in the last three days of May, and continued during each rainy period. The calyx application in the tests described, made on June 10, was six days later than normal, and further spraying was carried out 10, 20, and 28 days later. Artificial inoculations showed that the advance in the maturity of the leaves not only reduces their susceptibility but also retards the appearance of the spots and the production of new conidia.

The results of the spraying experiments indicated that copper dust did not give good control, and caused much russeting and leaf spotting. Individual records show that russeting was not correlated with location, foliage density, or percentage of scab infection. Lime-sulphur applications produced more russeting than the 'pomodust' (90 per cent. sulphur and 10 per cent. lead arsenate) and less than the copper dust. Least scab (1 per cent. or less) occurred after five applications of dry lime-sulphur, four applications of liquid lime-sulphur, or six applications of sulphur dusts. The amount of scab was somewhat higher (1 to 2 per cent.) when a casein spreader was used in combination with four liquid lime-sulphur sprayings, or when only two applications of liquid lime-sulphur were given, and still more (2 to 4 per cent. or more) with pomodust applied five times, with copper dust applied six times, or in the controls. Variations in the amount of fruit scab on individual trees was not correlated with the amount of leaf infection, or with density of foliage or position in the orchard.

The total yield of fruit was not appreciably affected by any fungicidal treatment. The amount of scab on the fruit in any plot was determined by the current season's fungicidal schedule rather than by the amount of scab present on the fruit during the preceding season. No apparent residual effect resulted from the 1924 treatments.

In comparing the costs of the various fungicidal treatments, it appears that dusting costs slightly less than the liquid lime-sulphur. Six copper or sulphur dustings cost about the same as five sprayings with dry lime-sulphur and appreciably more than four applications of liquid lime-sulphur.

A modification of spray schedules to fit the seasonal and local variation in the time and severity of the first scab infection is difficult owing to the small proportion of leaves found to contain mature ascospores. Although the discharge of ascospores begins the seasonal activity of the disease in most apple varieties, observations on a group of severely attacked young McIntosh trees

showed that the first scab infection in this case originated from scab pustules on the twigs, which enabled the fungus to overwinter in the mycelial condition and to produce conidia early in the season independently of previous infection by ascospores.

The results of experiments with stored Ben Davis and McIntosh apples submitted to different combinations of environmental conditions at Orono, Highmoor, and Portland showed that very few of the scab spots enlarge during storage, but new spots may develop from incipient infections not readily visible at the time of packing. In Ben Davis the highest temperatures tested (75° to 85° F.) gave the fewest new spots. Apples stored under dry conditions developed new spots more slowly than those exposed to damp. Much less storage scab developed on fruit from sprayed trees than on fruit from unsprayed trees. Preliminary experiments gave no evidence of spread of the disease through handling the fruit at packing, or through proximity to scab-infected fruit in the barrel during storage.

YOUNG (H. C.), HOUSER (J. S.), & BALLOU (F. H.). **Spraying program for the orchard and fruit garden.**—*Ohio Agric. Exper. Stat. Bull.* 393, 26 pp., 2 figs., 1926.

The present bulletin is intended as a guide to the Ohio fruit growers in the control of insect pests and fungus diseases. Spray and dust formulae, together with treatment programmes, are given for the various fruit crops, and an attempt is also made to point out the comparative value of spray materials. In regard to dusts, the statement is made that up to the present they have been only partially effective in the control of fruit diseases. In 1925, a dry season when apple scab [*Venturia inaequalis*] was easy to control, the finer grade of ground sulphur gave excellent results, while in 1924, a season favourable to the development of scab, it did not give commercial control. Experiments during the same period also indicated that the more finely ground sulphur was most effective when used without an alkaline filler or spreader.

SPEYER (W.). **Ueber den Laubfall an Apfelbäumen und das Abfallen unreifer Kirschen im Niederelbischen Obstbaugebiet.** [On the leaf fall of Apple trees and the dropping of unripe Cherries in the fruit-growing region of the Lower Elbe.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 12, pp. 95–97, 1926.

For some years past the apple harvests in the orchards of the Lower Elbe have been greatly reduced by three types of abnormal leaf fall, occurring in the spring (10th to 20th May), summer (first half of June and again from the middle to 25th July), and early autumn (end of August onwards), respectively. During the first period the primary cause of the trouble was probably the partial breaking of the petioles by the spring gales, which resulted in the drying up of the vascular bundles. The Boskoop variety is chiefly affected by this type of leaf fall.

The summer leaf fall, which is a problem of far greater economic importance, appears to be associated with a number of climatic and soil factors which disturb the water balance of the trees by

conducing to increased transpiration and to the reduction of the supply of water to the roots. The result is evidently a highly complex case of physiological drought, involving far-reaching changes in the metabolism of the trees. The severe attacks of the apple sucker (*Psylla mali*) in 1925 probably contributed in some degree to the leaf fall of 1926, which affected chiefly the Coulon Reinette, Boskoop, Rambour, Lord Grosvenor, and Otterndorf Prince varieties.

The premature autumn leaf fall seems to be associated with infection by *Fusicladium* [*Venturia inaequalis*], to which the damp climatic conditions of the Lower Elbe are particularly favourable. This type of leaf fall occurs primarily on the Gravenstein, Rambour, Transparent Croncels, and Golden Pearmain varieties.

The so-called 'pox' of cherries, characterized by the partial reddening, shrivelling, and dropping of immature fruit, caused heavy damage in 1926. This disturbance is probably also attributable to physiological causes.

DILLON WESTON (W. A. R.). **An 'eye' rot of Pears.**—*Gard. Chron.*, lxxx, 2080, p. 373, 1 fig., 1926.

The occurrence is reported of 'eye' or calyx rot of Fertility pears in two orchards (one at Wisbech and the other near Cambridge) during the season of 1926. The disease, which is known to occur in Denmark [*R.A.M.*, ii, p. 218], Holland, and Germany, is similar to the eye rot of apples, both being due to *Cylindrocarpon mali*, the conidial stage of *Nectria galligena*. As an indication of the damage that this disease can cause in apples, a case is cited where 1¼ tons out of a total bulk of 5 tons of the highly susceptible Worcester Pearmain variety were rendered unmarketable by eye rot. The perithecial stage of the fungus is not found on the fruit in the current season, but if the latter remains on the tree the resulting 'mummies' may bear perithecia in the following spring. Affected pears generally begin to decay at the calyx end, the top of the fruit becoming flattened as the disease progresses, and the skin and flesh turning brown. The small, raised, dirty white to pinkish pustules of the fungus develop on the diseased areas. According to a statement made by Wollenweber in correspondence, the Signe Tillisch and President of England apple varieties are attacked by eye rot in Denmark and Holland, respectively. In German varieties of apple and pear the *Nectria* fruit rot appears to be rare, though it was first observed in the conidial stage in the endocarp of an apple at Dahlem (*Phytopath.*, [iii], p. 226, 1913).

NICOLAS (G.) & RIVES (L.). **Un nouvel exemple de plomb.** [A new example of silver leaf disease.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 2, pp. 124–126, 1926.

In continuation of the first-named author's earlier work [*R.A.M.*, v, p. 432], a description is given of a non-parasitic case of silver leaf in a bush of *Euonymus japonicus* in the neighbourhood of Toulouse. The diseased condition of the leaves was caused, in the author's opinion, by the abnormally low temperature which

occurred in January, 1926, in the locality, a peculiar feature being that the leaves covered by snow remained green, while those that were sheltered from the snow exhibited after a few days the characteristic discoloration on their upper side.

SORDINA (J. B.). **Observations sur le 'plomb'.** [Observations on silver leaf disease.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 3, pp. 217–218, 1926.

Following on Nicolas's communication on the non-parasitic production of silver leaf [see preceding abstract], the writer gives some similar observations made recently in Corfu. Silvered trees of *Viburnum tinus* were found to show quantities of *Heliothrips haemorrhoidalis* on the lower surface of the leaves. *Citrus judaica* leaves were found to harbour the same insect, but no silvering had occurred. In a bush of *Myrtus communis*, silvering was attributed to the presence of *Tetranychus telarius*, the insect that produces fireblast in England.

GUYOT (L.) & JOESSEL (H.). **Contribution à l'étude des traitements rationnels des vergers.** [Contribution to the study of a rational treatment of orchards.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 3, pp. 219–240, 1926.

The writers, in this paper, put on record some experimental treatment of orchards in the Rhone Valley carried out during the last four or five years, at first by Chabrolin [*R.A.M.*, v, p. 304] and subsequently by themselves. With regard to the leaf curl disease of peach trees (*Exoascus* [*Taphrina*] *deformans*), experimental evidence is given of complete control of this disease by means of spraying with Bordeaux mixture, containing 3 per cent. copper sulphate, during the months of November or December. The advantage of treatment at this more or less slack period, over the old method of spraying just before flowering, i. e., about the middle of February, is obvious. Moreover, the spring treatment does not result in such complete control as winter spraying. The difficulty of explaining the beneficial action of early spraying, in view of the well-established hibernation of the mycelium within the tissues, is discussed at some length.

Secondly, with regard to chlorosis of peach trees, the writers describe experiments carried out to discover whether the winter spraying with a strong solution of ferrous sulphate, which has hitherto been the recognized treatment for this disease, could be combined with the above-mentioned spraying with Bordeaux against leaf curl. The results of these trials showed that while mixture of solutions of ferrous sulphate and Bordeaux at the strengths at which these are ordinarily used had no real value, a very strong solution (40 per cent.) of the former, used alone, was effective in controlling both diseases satisfactorily. The explanation of the beneficial effect of this solution on leaf curl is suggested to be the fact that, in curing chlorosis and in acting as a general antiseptic, the solution so improves the vigour of the trees that they become able to withstand the attacks of *T. deformans*.

Thirdly, the question of a possible winter treatment of blossom wilt (*Monilia*) [*Sclerotinia cinerea*: *R.A.M.*, i, p. 180] of apricots

is discussed. The usual treatment of spraying with a cupric mixture in February, just before flowering, combined with a severe winter pruning, is considered to give a satisfactory control of this disease. The advantages of an additional winter treatment, however, are pointed out, and some successful results of spraying in December, 1925, with copper sulphate, colloidal copper, and ferrous sulphate are briefly described. The advantages of such a method of controlling this disease are so considerable that further extensive tests of winter treatments are recommended.

HARRIS (R. V.). **Three Raspberry diseases.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1925, to 31st December, 1925*, pp. 64–70, 3 figs., 1926.

Investigations on the diseases of cultivated raspberries at East Malling were begun in the winter of 1923. In this paper a description is given of the characteristic symptoms of three diseases of common occurrence, with suggestions for their control.

Blue stripe wilt [*Verticillium* sp.: *R.A.M.*, iv, p. 748] is responsible for the death of a large proportion of new and fruiting canes. A full description of the disease, with special reference to the characters by which it can be distinguished from the other two, is given.

A cane spot disease, first seen at the end of May, affects the upper portion of the canes, at the onset frequently causing arrested development and subsequently, in many cases, the death of the plant. A fungus is associated with the disease which resembles closely the cause of a similar disease reported in America [? *Plectodiscella veneta*]. Inoculation experiments in order to establish the pathogenicity of this organism are in progress. The disease is marked by the appearance of small, dark purple spots, about $\frac{1}{8}$ inch in diameter on the young canes; as these spots increase in size, the colour of the central portion changes to greyish, bordered by a purple ring. Shallow depressions are eventually formed, in some cases exposing the wood. In severe attacks the spots run together and large canker-like wounds are formed; in such cases the canes often die back from the tip and the upper parts have a contorted appearance. Similar ringed spots also appear on the leaves, sometimes aggregated together in patches between the main veins of the leaf. Badly infected leaves are often curled and the petioles may be severely cankered. Infection may, however, be purely superficial, especially on the hardened surface of new canes attacked late in the season. In such cases only small, white spots or an irregular whitish patch is formed. From late autumn onwards the early stages of the fructifications of the fungus may be found as minute black dots on these whitish areas.

Further investigations are in progress in connexion with mosaic disease of raspberry, the symptoms of which are briefly described [*R.A.M.*, iv, p. 99]. During the season of 1925 it was observed that the severity of attack appears to be noticeably increasing in some varieties, the canes becoming much dwarfed, so that it is evident that a disastrous effect on the crop can be produced by this disease.

The control of these three diseases is being studied in relation to

the susceptibility of different varieties and the possibility of securing healthy stools for propagation purposes. There is evidently some inherent susceptibility in the two varieties Baumforth B. and Bath's Perfection to blue stripe wilt and mosaic. Baumforth B. is also very susceptible to the cane spot disease, and the Superlative variety to mosaic. A survey of the incidence of these diseases on other commercial varieties is in progress, especially with a view to determining the influence of locality and environment on susceptibility. Experiments have shown that mosaic is carried in the stools used for propagation and a careful selection of the stools intended for new plantations is necessary. The same applies to blue stripe wilt. In cane spot all infected canes should be cut out in order to protect the next year's crop. In established plantations all stools infected with mosaic or blue stripe should be grubbed up and burnt. Trials of spraying against cane spot are in progress.

Bunchy top in Bananas. The nature of the disease and the measures recommended for its control.—*Agric. Gaz. New South Wales,* xxxvii, 8, pp. 603–612; 9, pp. 697–705, 9 figs., 1926.

The final report of the bunchy top of bananas Investigation Committee in Australia is summarized in this article, in which it is stated that there still remain certain aspects of the problem requiring further investigation, which will be continued at the University of Queensland, Brisbane. The principal information obtained as a result of the Committee's work on the etiology, symptoms, and control of the disease under Queensland conditions has already been noticed [*R.A.M.*, v, p. 506]. It has been definitely proved that the chief vector of the disease is the dark banana aphid (*Pentalonia nigronervosa*), the final and conclusive evidence being obtained under glasshouse conditions in September, 1925. In this work it was established that only such aphids as had fed on diseased banana plants were capable of transmitting the disease. Since careful examination has failed to reveal any parasitic organism, it is concluded that the disease belongs to the class of transmissible diseases caused by an ultra-microscopic agent or virus, and to have analogies with leaf roll of the potato. Sap inoculations have hitherto failed to reproduce the disease. The available evidence indicates that the virus is not soil borne, nor have any other susceptible plants been discovered, except species of *Musa* (including *M. textilis* and a seed-bearing indigenous wild species, *M. banksii*). Directions are given for the detection of the disease, the symptoms of which are first apparent about a month after infective aphids have been placed on the healthy plant. No measure of protection against these insects has yet been found efficient, nor has any reputed remedy been found satisfactory. There is thought to be little hope of obtaining resistant or immune varieties or species. Exclusion of the disease in unaffected or slightly affected areas, and measures for eradication where bunchy top is well established represent, therefore, the only means available for controlling the disease.

A series of recommendations have been made to the Govern-

ments concerned with a view to restoring the industry in heavily infected areas to its former status. Special attention is called to the necessity of taking every possible measure to protect uninfected areas from the introduction of the disease. Government facilities are urged for giving effect to the recommendations, which include the prohibition of the moving of suckers or banana trash from infected districts, the destruction of all banana plants in backyard and small gardens (other than registered banana plantations), the registration of all banana plantations in Queensland and New South Wales, and provision for the regular destruction of infected plants after a preliminary eradication under legislative control. Practical instruction to facilitate identification of the disease at the earliest possible stage is recommended. A weekly examination of each plant is necessary, immediate attention being given to any affected stool, which should be thoroughly sprayed with black leaf 40 in order to kill any aphids present, and then removed, cut up, and destroyed.

Bunchy top—Departmental action.—*Queensland Agric. Journ.*, xxvi, 4, pp. 297–298, 1926.

Since the discovery of the bunchy top disease of bananas in the Dayboro and Caboolture districts of southern Queensland [see preceding abstract], a survey of the neighbouring plantations showed that the disease had spread and had become established in several parts of these districts, but not to as serious an extent as in the older infected areas. Owing to movements of infected material, small outbreaks have also occurred in the Beerwah and Maroochy districts immediately to the north; steps were at once taken, however, to destroy every stool that showed any trace of the disease, and the further spread northwards has been stopped. A slight outbreak was also reported in the Innisfail district of northern Queensland as a result of infected plants having been sent there from the Dayboro district, but it is stated to be well in hand. In order to prevent the possibility of further spread, the transfer of banana plants in any part of the State was totally prohibited by a proclamation issued on 28th April, 1926. Should, however, a new inspection of the area to the north of the Maroochy river, which it is intended to make immediately, fail to reveal any trace of bunchy top, permission will be granted to sell or transfer plants in that part of the district, subject to their first being inspected and found free from disease. In the area in which the disease exists, the transfer and sale of banana plants will only be permitted within this area subject to the above-mentioned restrictions, but no plants will be allowed to be exported to other districts.

Ocfemia (G. O.). **Progress report on bunchy-top of Abaca or Manila hemp.**—*Phytopath.*, xvi, 11, p. 894, 1926.

This is a short report of work on bunchy top disease of abaca or Manila hemp (*Musa textilis*) in the Philippine Islands [*R.A.M.*, iv, p. 468]. This disease is assuming alarming proportions, and observations indicate that affected plants never recover. Aphids, determined as *Pentalonia nigronervosa*, were found on the young

leaves of healthy and diseased plants. Experiments showed that the disease may be spread from affected to healthy plants by these aphids. The same insects have been shown to be a transmitting agent of bunchy top of banana in Australia [see preceding abstracts].

CONDIT (I.). **The Loquat in California.**—*South African Fruit Grower*, xiii, 10, pp. 281–283, 2 figs., 1926.

The following diseases of the loquat (*Eriobotrya japonica*) are noted on page 283 of this article. Anthracnose or blossom blight (*Colletotrichum* sp.) is stated to have been prevalent in southern Florida in 1907. *C. pollaccii* has been reported on loquats in Italy.

Black spot or scab (*Fusicladium dendriticum* var. *eriobotryae*) is common in California, both on nursery and bearing trees. The fruit, when half grown, develops brownish-black spots which soon extend and cause further growth to cease, and the fleshy part of the pulp becomes desiccated. A large proportion of the crop may thus be rendered absolutely unsaleable in a short time. In Italy this fungus is known to attack the leaves, and it is stated to be a serious disease in Australia. Spraying with Bordeaux mixture after the blossoms have fallen and when the fruit is setting should be effective.

Fire blight (*Bacillus amylovorus*) is a serious enemy of the loquat, the blossom blight form of the disease often being especially abundant on trees during the spring months. Entire trees are occasionally killed by the blight, which gradually extends downward from the branches into the trunk. Infected twigs should be cut well back from the diseased area and burned, care being taken to sterilize the pruning shears in alcohol or formalin after each cut. The Advance variety of loquat is quite resistant. Full grown Victor trees are more or less immune, though very susceptible when young, and in general the trees seem to gain resistance as they grow older.

The oak root fungus (*Armillaria mellea*) is reported to have killed a loquat tree in Santa Barbara County, California.

In South Africa a species of *Entomosporium* attacks young nursery and bearing trees, but does not appear to cause serious damage [*R.A.M.*, ii, p. 70].

HOLLAND (E. B.), DUNBAR (C. O.), & GILLIGAN (G. M.). **The preparation and effectiveness of basic copper sulphates for fungicidal purposes.**—*Journ. Agric. Res.*, xxxiii, 8, pp. 741–751, 1926.

In view of the increasing demand for ready-made copper preparations to replace Bordeaux mixture, and of the fact that the proprietary fungicides already on the market are not altogether satisfactory, the authors undertook the present study of the question with a view to producing a powder of good physical properties that might be applied either as a spray or as a dust. Since basic copper sulphates have generally been found preferable to basic carbonates, attention was largely turned to these, and more particularly to the following, which appear sufficiently established to

warrant consideration: dibasic sulphate, $3CuO \cdot SO_3 \cdot nH_2O$; tribasic sulphate, $4CuO \cdot SO_3 \cdot nH_2O$; tetrabasic sulphate, $5CuO \cdot SO_3 \cdot nH_2O$; nonobasic sulphate, $10CuO \cdot SO_3 \cdot nH_2O$; and pentabasic disulphate, $7CuO \cdot 2SO_3 \cdot nH_2O$. Notes are given on the preparation of these compounds, and also on the action of various precipitants used in preliminary work. While a number of the latter gave promising results, calcium carbonate was finally selected for investigation, both on account of the character of the resulting precipitate and because it is readily obtainable and comparatively inexpensive.

The process finally evolved was as follows: 7·49 gm. of copper sulphate in 150 c.c. of solution heated to 80° C. were added in 5 to 6 minutes to 2·5 gm. of precipitated calcium carbonate in 75 c.c. of water at 80°, stirred vigorously for 30 minutes (including the period of precipitation) at the same temperature, filtered immediately, dried at a low temperature, and passed through a 0·5 mm. sieve. The yield of air-dry precipitate, consisting of basic copper sulphate, calcium sulphate, and excess carbonate was 7·07 gm.—the average of 60 determinations. The crude basic copper sulphate thus obtained is a light, bulky powder, of good flow, free from grit, and adapted as a spray or dust. Its copper content is similar to that of ordinary copper sulphate, and it can presumably be used at the same concentrations as Bordeaux mixture.

The fungicidal properties of the preparation were tested in the laboratory with spores of *Venturia inaequalis*, *Cercospora apii* var. *carotae*, *Botrytis cinerea*, *Macrosporium carotae*, and *Puccinia antirrhini*. It was found to be somewhat less effective than Bordeaux mixture with the more resistant fungi. In control experiments conducted at the Market Garden Field Station at Waltham, Mass., with artificially induced cucumber anthracnose (*Colletotrichum lagenarium*) and late celery blight (*Septoria apii*), and in the case of a natural outbreak of early celery blight (*Cercospora apii*), the observations as well as yield of the crops indicated that it was approximately as efficacious as Bordeaux mixture. It is pointed out that the adhesiveness of basic copper sulphate is naturally inferior to that of freshly prepared Bordeaux mixture; several adhesives and spreaders were tested to obviate this defect, of which gum arabic, glue, and rosin fish-oil soap appeared the more promising.

BEAUVERIE (J.). **Critique des bases cytologiques de la théorie du mycoplasme.** [Criticism of the cytological bases of the mycoplasm theory.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 3, pp. 209–216, 3 figs., 1926.

In this communication the writer gives a cytological explanation of Eriksson's mycoplasm theory based on the phenomena which follow degeneration of the plastids [*R.A.M.*, v, p. 753]. This degeneration may be the result of different causes, and it is plainly visible in fixed and stained preparations. The explanation of the phenomena observed is based on comparisons with similar preparations of fresh material. The successive stages of Eriksson's mycoplasm globules are considered to represent three different sorts of degeneration. In the first, there is a disintegration of the fundamental material of the plastids, or of the pigments elaborated by

them, or of both. This may occur as a result of the weakening action of the fungus on the plastid substance, which renders it liable to undergo a granular degeneration when acted on by the fixing agent. Secondly, there is a persistence of the mitaplastids (inactive mitochondria) after the destruction of the chlorophyll. Thirdly, there is a disintegration of the intracellular mycelium or haustoria of the attacking fungus resulting in the survival of only the metachromatic bodies. In the first two cases the degeneration takes place by the action of the parasite on the host cells; in the third the invading mycelium is caused to break up by the reaction of the host cell against it. In each of the three cases the final result of degeneration is a series of stainable globules, which are identical with those shown in Eriksson's figures of mycoplasm.

KILLIAN (C.). **Variations des caractères morphologiques et biologiques chez les Ascomycètes et les Deutéromycètes parasites.** [Variations of morphological and biological characters in parasitic Ascomycetes and Deuteromycetes.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 2, pp. 129–166, 1926.

The author discusses the sub-specific units (varieties or races) that are frequently encountered in fungi, especially amongst parasitic species, and distinguishes between those that occur in obligate parasites and those that can be studied by cultural means. He gives a number of examples from the Ascomycetes and Deuteromycetes.

Amongst the non-cultivable species *Rhytisma acerinum*, *Taphrina aurea*, *T. johansoni*, *Claviceps purpurea*, *C. microcephala*, and *Plowrightia morbosa* [*Dibotryon morbosum*] are shown to include races differing from one another chiefly in biological characters, such as host range, but also in some cases in slight morphological peculiarities.

The saprophytes and cultivable parasites lend themselves better to the study of these sub-specific divisions, since they can be more freely subjected to variations of the environment in a broad sense. Differences of a morphological character have been demonstrated between parasitic and saprophytic races of fungi such as *Botrytis cinerea*. Even amongst fungi that are apparently purely saprophytic like *Mycosphaerella punctiformis*, races specialized to certain categories of dead leaves (oak, lime-tree, hazel) have been observed. Parasites have been found that have races differing from one another only in morphological characters (e. g., *Pestalozzia guepini*, *Coniothyrium diplodiella*), but frequently the morphological distinctions are coupled with differences of a physiological nature, as in some sexually differentiated strains and many parasites of the type of *Pseudopeziza ribis* and *Sclerotinia*.

A detailed description is given of the variations in racial characters of *Sclerotinia*, *Septoria*, *Ramularia*, *Gloeosporium*, *Colletotrichum* (*Glomerella*), and *Fusarium*, based chiefly on work already noticed in this *Review*.

Finally, the author considers the problem of the origin of biological variations, and inclines to the view that a fundamental part in this process is played by mutation. He quotes a number of cases of this phenomenon that have been recently described, and

discusses the various theories that have been advanced to explain it. In his opinion the sexual origin of mutation in fungi is highly problematical. Summarizing, he states that up to the present we not only do not know how variations arise in parasitic fungi, but we even have no criterion to judge whether these variations have any taxonomic value. The present definition of morphological, biological, and physiological species is purely conventional, and no sharp limits exist between such units. A comparative study of these variations may, however, yield new conceptions in regard to their origin, and may throw further light on the evolution of species.

A bibliography of 79 titles is appended.

BAUNACKE [W.]. **Der Pflanzenschutzdienst im Freistaate Sachsen und seine Bedeutung für Pflanzenschutzmittelindustrie, Pflanzenschutzmittelhandel und Pflanzenbau.** [The plant protection service in the Free State of Saxony and its importance to the industry and commerce in plant protection preparations and apparatus, and for the cultivation of plants.]—*Die Kranke Pflanze*, iii, 12, pp. 213–228, 1926.

In this report of a paper read at the autumn meeting of the Industrieverband für Pflanzenschutz E.V. in Dresden in September, 1926, the author describes at length the various activities of the Plant Protection Service in Saxony, and dwells on the important part it has already come to play in the agriculture of the state, and more particularly on its significance in raising the standard of the trade in fungicides and insecticides by its supervisory functions.

BREMER (H.). **Zur Methodik epidemiologischer Untersuchungen im landwirtschaftlichen und gärtnerischen Pflanzenschutz.** [On the technique of epidemiological investigations in agricultural and horticultural plant protection.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 11, pp. 87–89, 1926.

A simple method for the quantitative estimation of some of the principal fungous diseases and insect pests of agricultural and horticultural plants is briefly described, with some general observations on the importance of meteorological factors in this connexion and references to relevant literature.

MILLARD (W. A.). **Internal rust spot of Potatoes.**—*Nature*, cxviii, 2979, p. 804, 1926.

In this preliminary note the author states that investigations regarding the etiology of sprain or internal rust spot of potatoes, the cause of serious damage in Yorkshire, have resulted in the isolation (by Mr. S. Burr) of two short and motile rod-shaped bacteria, which on inoculation reproduced the disease in a very definite and characteristic way. These organisms are cultivated only with difficulty, and thrive best on liquid media, e.g., peat soil extract and nutrient potato broth. On soil extract agar they produce minute dew-like colonies which later become steely blue in colour. They do not appear to bear any resemblance to the two variants of *B.* [*Pseudomonas*] *solaniolens* isolated by Paine from potatoes showing similar symptoms of disease [*R.A.M.*, iii, p. 420].

In addition to the rusty brown spots surrounded by a cork layer, commonly found in the medulla and cortical parenchyma of affected tubers, the xylem is frequently attacked, but in this case wound cork is not formed unless the adjoining cells of the pericycle are also affected. The phloem bundles do not appear to be directly attacked, although they may ultimately be involved by the infection of the neighbouring parenchyma. Net necrosis, which is primarily an infection of the phloem bundles, may therefore be definitely dissociated from the rust spot disease.

ATANASOFF (D.). **Sprain or internal brown spot of Potatoes.**—*Phytopath.*, xvi, 10, pp. 711–722, 1 pl., 3 figs., 1926.

In this paper the author brings forward certain evidence in favour of the parasitic nature of the sprain or internal brown spot disease of potatoes [see preceding abstract], although he does not accept the conclusions of Paine and Swellengrebel, and states that inoculation experiments carried out by him with bacteria isolated from diseased tubers yielded negative results.

In Holland sprain is found on heavily manured soils or soils naturally rich in organic material [*R.A.M.*, v, p. 573]. It has never been found on clay soils, although these may be only a short distance from areas where the disease is known to occur. Lack of moisture is not considered to be instrumental in producing the symptoms of this disease, as some have claimed, but, on the contrary, moisture seems to be a necessary factor for their development. In the exceptionally dry summer of 1921, for instance, the disease caused little injury in a field where the tubers were usually severely attacked. Also, in 1925, during the dry period up to June 15th, the early and very susceptible variety Schotsche Muis (Midlothian Early) was free from the disease, after which date there was a considerable amount of rain, and ten days later numerous cases of sprain were observed.

Scabbing of the periderm and slight or more pronounced depressions occur in the tubers at the point of entry of the causal agent. The subsequent browning of the tuber parenchyma radiates from the point of infection, and is usually visible on the exterior of the tuber. The cause of the disease would therefore seem to be either a chemical substance or an organism; but the former alternative seems improbable, since no general poisoning of the tuber surface takes place.

Further evidence that the disease is caused by a living pathogen is provided by the facts that it is not transmitted with the potato seed, and that it can be transmitted to healthy tubers by grafting portions of diseased tubers on them.

A bibliography of 59 titles is appended.

MILLARD (W. A.) & BURR (S.). **A study of twenty-four strains of Actinomyces and their relation to types of common scab of Potato.**—*Ann. Appl. Biol.*, xiii, 4, pp. 580–644, 6 pl., 2 figs., 1926.

The authors, being of opinion that various isolations of the potato scab organism could not be included in the single species *Actinomyces scabies*, have made a detailed investigation of these

strains in pure culture and of the different types of scab which they produced on inoculation into potato tubers.

Twenty-four strains of *Actinomyces* were isolated from potato scabs and other sources, and a technique was evolved for maintaining their cultural characters constant in sub-culture. Each strain was fully tested for pathogenicity by methods which are described in detail. The results of these experiments showed one species identical with the original scab organism *A. scabies* both in its cultural characters and in the nature of the lesion it produced, while the remainder, allowing for some duplicate strains, are regarded as belonging to 19 new species, which are named, with full particulars of their morphological, cultural, and biological characters. Eleven of the species produced scab on potatoes.

Descriptions are given of the different types of scab found or produced during the course of these investigations. The differences are believed to be due chiefly to the different species of *Actinomyces* concerned, though the variety of potato may slightly modify the type of disease. *A. scabies* produces a deeply furrowed scab ('deep scab'), and may also be found attacking the roots and stolons of the plants.

There is also a discussion on the occurrence of scab in virgin soils, and the predominance of certain types of scab in certain soils and in different years.

DUCOMET [V.] & FOËX [E.]. **La maladie verruqueuse de la Pomme de terre.** [Wart disease of the Potato.]—*Comptes rendus Acad. d'Agric. de France*, xii, 33–34, pp. 935–938, 1926.

The results of a series of varietal susceptibility trials in connexion with the outbreak of potato wart disease (*Synchytrium endobioticum*) at Russ-Hersbach (Lower Rhine) [*R.A.M.*, v, p. 124] are summarized. In general, the data correspond with those obtained in England, Germany, Holland, Czecho-Slovakia, and the United States, but a few exceptions should be noticed. Thus, Roode Star and Roode Industrie, both immune in England, were heavily attacked at Russ, while Ursus, which is susceptible in England and the United States, is immune. The Triumph variety, resistant in Holland, was slightly attacked at Russ, while the Quarantine de la Halle, which withstood infection at Ormskirk, was heavily infected in Alsace. Probably two distinct varieties have been confused in the latter case, indicating the necessity for a study of varietal synonymy.

The provisional results of a hybridization experiment which is proceeding at Russ show that crosses between resistant varieties are likely to give resistant progeny, e. g., in the case of Favourite × Hindenburg, though such crosses may also produce susceptible forms owing to the heterozygous constitution of the parents. Crosses between resistant and susceptible strains (e. g., Fin de Siècle × Shamrock) may also produce resistant varieties.

Considerable differences were observed in the degree of tuber infection in the different varieties, Beauvais, Marjolaine, and Rosa de l'Eure being very severely attacked. In milder cases the last-named variety forms aerial tubers. *Solanum commersoni*, *S.*

dulcamara, Pierrette and Mikado tomatoes, and *Lycium barbarum* were also attacked.

Undersøk Poteterne efter Potetkræft. [Examine Potatoes for Potato wart.]—*Norsk Havetid.*, xlii, 17, pp. 199–200, 1 fig., 1926.

Wart disease of potatoes [*Synchytrium endobioticum*] is stated to have recently occurred in several fresh localities in Norway [*R.A.M.*, v, p. 192], and attention is drawn to the obligation of reporting all suspected cases to the proper authorities. A brief, popular account is given of the life-history of the causal organism.

DUCOMET (V.). **Nouvelles observations sur la filosité de la Pomme de terre.** [New observations on the 'filosité' of the Potato.] —*Rev. Path. Vég. et Ent. Agric.*, xiii, 2, pp. 172–178, 6 figs., 1926.

Observations made since 1923 on the origin of cases of 'filosité' of the potato [*R.A.M.*, iii, p. 188] lead the author to consider this trouble as entirely distinct from the so-called degeneration diseases of this crop, although it may occur in association with other diseases, and notably with internal rust spot or net necrosis (*Pseudomonas solaniolens*) [but see above, p. 178]. In support of this view is the repeated observation that tubers from plants affected with 'filosité' sometimes produce normal shoots. Complete 'filosité' may appear suddenly in a line of known health for several years. A case is also cited of a cross of Roode Star × Rosa first sown by seed in 1924, a single tuber of which in 1925 produced tubers entirely affected with 'filosité'. The author's studies seem to indicate that the origin of the trouble is in the mother plant, but it is not yet possible to say whether the absence of invariable hereditary transmission is real or is only due to the disease being able to persist in a latent condition.

HOWITT (J. E.) & EVANS (W. G.). **Corrosive sublimate and time of treatment in relation to yield and control of Rhizoctonia.** —Abs. in *Phytopath.*, xvi, 10, p. 755, 1926.

As a result of six years' experiments, it has been found that the strengths of corrosive sublimate, and times of immersion generally recommended for the treatment of seed potatoes against *Rhizoctonia* [*solani*], namely, 1 part by weight to 2,000, 1,000, and 1,200 parts of water for 3, 2, and 1 hours, respectively, do not reduce the amount of the disease sufficiently to ensure the production of clean seed potatoes [*R.A.M.*, vi, p. 115].

The use of stronger solutions of corrosive sublimate has proved very satisfactory, provided that the treatment is carried out in early spring, when the potatoes are completely dormant. In tests lasting over five years a strength of 1 part by weight in 500 parts of water for two hours practically eliminated all disfigured tubers; the average percentage of infected tubers being 2·2 as compared with 68·43 for the untreated.

LAURITZEN (J. I.) & HARTER (L. L.). **The relation of humidity to infection of the Sweet Potato by Rhizopus.**—*Journ. Agric. Res.*, xxxiii, 6, pp. 527–539, 1 fig., 1 graph, 1926.

The results of experiments carried out on the Yellow Jersey, Big Stem Jersey, and Porto Rico varieties of sweet potato recorded by the authors in this paper show that infection by *Rhizopus nigricans* and *R. tritici* occurs almost exclusively through fresh wounds.

The optimum relative humidity for infection of halved roots at a temperature of 25° C. ranges from 75 to 83 per cent. and a rapid decrease of infection was evident as the humidity was raised above or lowered below this optimum. Very few infections occurred on roots held at high humidities for some days and then exposed to lower humidities, but roots subjected to the reverse treatment became infected. The resistance exhibited by sweet potatoes at high humidities (89 to 97 per cent.) was shown to be located in the surface layers of the wounded areas and is believed to be due to some change occurring in the host, possibly having some relation to cork formation [*R.A.M.*, i, p. 38]. The fact that infection does not take place readily at low humidities may be owing to insufficient moisture for the development of the pathogen, but further evidence is needed on this point.

Experiments conducted through three seasons in which unwounded Yellow Jersey potatoes were kept at high humidities at various temperatures, for periods of 56 to 150 days, resulted in only a few (0 to 3·2 per cent.) becoming infected by *Rhizopus*.

RHIND (D.). **The diseases of Para Rubber in Burma.**—*Dept. of Agric. Burma Bull.* 14, 16 pp., 9 figs., 1926.

Root diseases of *Hevea brasiliensis* are stated to be comparatively rare in Burma and not troublesome unless treatment is neglected. The three diseases which occur are wet rot (*Fomes pseudoferreus*), brown root disease (*Fomes lamaoensis*), and *Ustulina* root disease (*U. zonata*). *Sphaerostilbe repens* is also present on dead jungle stumps and rubber wood, but has not been observed on living rubber. The symptoms and treatment of these diseases, of which wet rot is the most serious, are described.

The diseases of the stem are black thread (*Phytophthora meadii*), patch canker (*Phytophthora* sp.), pink disease (*Corticium salmonicolor*), stem attacks of *U. zonata*, die-back (*Botryodiplodia theobromae*), brown bast, and renewing-bark dry rot. For the control of black thread, which is active only during the monsoon (July to September), applications to the tapping cut of a boiled mixture of coco-nut oil 12 quarts, brunolinum or other similar disinfectant 2 quarts, and beeswax (for which paraffin wax may be substituted) 5 lb. have been found to be effective. Most of the disinfectants suitable for replacing brunolinum can be used at a strength of 20 per cent., but for izal 5 per cent. is sufficient. Jodelite and solignum require the addition of soft soap (1 lb. per gall.) to bring them into solution. On many estates it is the practice not to tap from the end of June to the end of September, but if small doses of this disinfectant mixture are frequently applied, tapping may safely be continued. There is no evidence that the fungus

lies dormant in the tapping cut from one season to another. For the treatment of brown bast, which is not a serious disease in Burma, probably never exceeding three per cent., the method of Keuchenius [*R.A.M.*, iv, p. 766] is recommended. Renewing-bark dry rot, which occurs in the dry season, especially in the Moulmein district, takes the form of an open wound on the renewing bark down to the wood, within about two inches of the cut. It is due to the drying-out of the cambium as a result of fine tapping (which leaves only a thin layer of bark over the cambium); 'overwintering' also occurs when the air is very dry and exposes the tapping cut to the direct action of the sun. No parasite has been found associated with this condition.

The only leaf disease observed in Burma is the abnormal leaf fall due to *Phytophthora faberi*, which occurs on every estate of mature rubber during the monsoon. The infection starts on the fruits and passes to the midribs and petioles of the leaves, which fall even when slightly attacked. Although spraying with Bordeaux mixture before the break of the monsoon checks the disease, it is not yet known whether this treatment can be adopted as a general estate practice in Burma.

The factory troubles mentioned are bubbles in the coagulum due to gaseous decomposition, rustiness, spotting of crepe rubber, caused by bacteria and species of *Aspergillus* and *Penicillium* [*R.A.M.*, iv, p. 311; v, p. 694], and mould on sheet rubber [ibid., v, p. 385].

WARD (F. S.). **Inoculation experiments in relation to sun-scorch on exposed lateral roots of Hevea brasiliensis.**—*Malaya Agric. Journ.*, xiv, 9, pp. 286–289, 1926.

Experiments were carried out with the species of *Diplodia* [*Botryodiplodia theobromae*] recently isolated from sun-scorched areas of exposed lateral roots of *Hevea brasiliensis* by Sharples in Malaya [*R.A.M.*, v, p. 761] in order to determine the actual mode of infection (whether direct or as a wound parasite), and the effect of scorching on the susceptibility of the root to invasion. In every case inoculations at wounded points gave negative results, but when the roots were subjected to scorching by fire, infection was successful. It is concluded that the fungus is not an ordinary wound parasite, as is commonly assumed, but is a special type which, under certain conditions of the heating of localized areas of cortical tissue can cause a strong infection, so that the fungus makes rapid headway in the woody tissue of the plant.

Roots which had been burnt but not inoculated showed the characteristic discoloration associated with sun-scorch, but this had only just penetrated the woody tissue, whereas scorched and inoculated roots showed a thorough impregnation of the wood with the fungus, associated with a typical grey discoloration.

Experiments were carried out in order to ascertain the approximate amount of scorching required to permit the free penetration of the fungus into the tissues of the root. Scorching by means of a red hot iron bar for five seconds was insufficient to permit penetration, but when the roots were scorched for thirty seconds, penetration was in some cases effected.

Similar effects were produced in branches inoculated with pure cultures after scorching with a hot iron bar for thirty seconds; as in the roots, the fungus developed throughout the woody tissue but did not spread in the cortex.

In connexion with these tests an examination was made of the fungi present in the so-called die-back of *Hevea*, which is common on hilly lands that have suffered badly from soil wash and also in neglected rubber plantations. The examination of 105 affected branches showed the presence of typical *Diplodia* in only 11 cases, while 22 had *Diplodia* together with other fungi or insects, and 72 had no *Diplodia*. *Polystictus hirsutus* was one of the commonest fungi found on the dead branches, *Hexagonia tenuis* and a white *Poria* being also frequently found.

FARIS (J. A.). **Cold chlorosis of Sugar Cane.**—*Phytopath.*, xvi, 11, pp. 885–891, 3 figs., 1926.

In this paper the author describes a chlorotic banding of the leaves of sugar-cane in Cuba, due, as he proved by controlled experiments, to low temperatures following heavy rains. The latter stimulate growth, and the night colds, with a temperature of 5° to 10° C., cause a chilling of any water standing in the folded apical shoot. This chilling is sufficient to injure the newly exposed tender tissues in such a way that the affected areas are unable to develop chlorophyll, and consequently become white. The bands are from 2 to 4 inches in length, and vary in width from a narrow stripe along the leaf margin, to areas which include the whole width of the leaf. The borders of the bands, although apparently sharply defined, are in reality, when closely examined, very irregular. This is due, in part, to growth following the first exposure. At times, green stripes are found along the veins. Such stripes are formed, it is thought, by the normal development of chlorophyll in the deeper tissues which have escaped injury from the cold. Occasionally the chlorotic areas are attacked by a fungus (*Coniothyrium* sp.) which forms an elongated greyish stripe, and leaf splitting may occur along these lines.

BONAZZI (A.). **Study on Sugar cane mosaic.**—*Science*, N.S., lxiv, 1665, pp. 529–530, 1926.

The method briefly described in the present paper, of inoculating sugar-canes with mosaic, is stated by the author to have given satisfactory results at the Chaparra Agricultural Experiment Station, Cuba, in testing the susceptibility of different cane varieties to mosaic. Mature canes from plants known to be healthy are divided into as many pieces as there are internodes with uninjured buds. From each cane the terminal and basal portions are separated and planted immediately to serve as controls. In the remaining pieces a hole is bored with a sterile 3-mm. cork borer diagonally into the node, immediately above the leaf scar and as close as possible to the bud, care being taken not to injure the latter. A small piece of fresh apical bud tissue from an infected cane is introduced into the hole thus obtained, which is then closed with

the disk of tissue excised by the cork borer, and hermetically sealed with a small cotton plug soaked in melted paraffin. Planting is carried out soon after inoculation. The infected tissue for inoculation should be removed from a freshly exposed apical bud only a few seconds before use, the cut being renewed every time new inoculum is taken. In an appended table are shown some of the results obtained by this method with the Foenix and Cavengerie varieties of cane.

HANSFORD (C. G.) & MURRAY (P. W.). **The mosaic disease of Sugar cane and its control in Jamaica. With a note on streak disease of Uba cane by H. H. Storey.**—*Jamaica Dept. of Agric. Microbiol. Circ.* 6, 39 pp., 1926.

In the first part of the present paper, for which Hansford is responsible, a brief account is given of the mosaic disease of the sugar-cane, including the history of its distribution in various parts of the world, its symptomatology, etiology, transmission in the field and in experimental work, range of hosts, and its effect on the sugar-cane crop. A section is devoted to the discussion of susceptible, tolerant, resistant, and immune varieties of cane, in which it is pointed out that tolerant and resistant varieties, especially P.O.J. 36 and 100, have the disadvantage that they may act as latent carriers of the disease. Some notes are also given on the control and eradication of mosaic in Jamaica, and a bibliography of 34 titles is appended.

Murray is responsible for the two following parts, the first of which gives an account of his field experience in the control of mosaic in Jamaica during the period from 1923 to 1925. While a survey in 1923 indicated that the disease was generally on the increase in the island, the spread has been checked owing to the methods of control introduced at the time, and a general reduction of its incidence was observed in 1925. Of the methods of control used, the chief is the system of roguing. Experience showed that, to be efficient, roguing must be carried out frequently and very carefully. The period between two successive roguings of the same field should not be more than ten days, and at least three roguings should be made from the moment of the appearance of the earliest visible symptoms. Where fields were badly infected, with an incidence of over 10 per cent., it was found to be economically preferable to allow the canes to mature and to replant the field after the cutting of the crop. In this case it appears advisable to allow the field to remain fallow for one or two months before replanting, in order to be able to remove any cane plants derived from the old crop. There are also indications that when the new canes are planted in the autumn they are less liable to infection than if planted in the spring. In the second part, the advantages and disadvantages of the Uba cane under Jamaica conditions are discussed in some detail, and a number of reports from local planters on their experience with this variety are appended.

The paper terminates by a short note by Storey on the streak disease of the Uba cane [*R.A.M.*, v, p. 2], a disease not yet recorded in the West Indies.

DASTUR (J. F.). **A mosaic-like disease of Sugar-cane in the Central Provinces in 1926.**—*Agric. Journ. India*, xxi, 6, pp. 429–432, 1926.

Since mosaic disease of sugar-cane was first observed at Pusa in 1921 [*R.A.M.*, iii, p. 364], there were no further reports on this disease until recently, when it was again observed at Pusa, and also in the United Provinces [ibid., v, p. 695]. Further observations in the Central Provinces have revealed cases of a mosaic-like disease in the varieties Java 213, Khari, Co. 203, and Red Mauritius, growing on various Government farms. All the evidence available seems to point to the first-named variety as having been the original source of infection. This disease is said by the author to differ from the typical mosaic of sugar-cane in that the patterns on the leaves are in stripes of light green or pale yellow, alternating with normal green areas and running parallel to the veins. In the bleached areas, short, thin lines of a dark green colour are sometimes visible. The affected leaves are generally erect and stiff, especially the young leaves from tillers, and they are sometimes also crinkled. The streaks are not confluent and do not cross the veins, whereas in mosaic the discoloured areas usually run across the veins, and irregular outlined designs are formed. In its general characters the disease is thought to resemble very closely the streak disease described by Storey from South Africa [*R.A.M.*, v, p. 1].

No organism has been found associated with this condition, but a cytological study of infected canes has shown the presence of protozoan-like bodies in all parts of the plant, including the xylem vessels. These are very similar to the bodies described by Nelson in Michigan as occurring in plants affected with mosaic and related diseases [*R.A.M.*, ii, p. 227].

Bureau of Sugar Experiment Stations. Fiji disease.—*Queensland Agric. Journ.*, xxvi, 4, pp. 280–281, 1926.

The present note is meant as a warning to sugar-cane growers of Queensland in view of the fact that the Fiji disease [*Northiella sacchari*] occurs in at least two districts in the south of that State. It gives a very brief description of the external symptoms, and some recommendations for control, the chief of which are that seed pieces of cane should never be cut from infected fields or in their immediate proximity, especially on rich soil, where the symptoms are less easy to detect. All fields with over 5 per cent. infection should be ploughed in after the harvest and rested for a season. All outbreaks of the disease should be immediately notified to the Bureau of Sugar Experiment Stations at Brisbane, stating the variety affected, the size of the field, and the locality of the farm. It is stated that N.G. 15 (Badila) and N.G. 16 are resistant to this disease, but that the susceptibility of the former to gumming [*Bacterium vascularum*] makes it unsafe for use in the Beenleigh district of Queensland. D. 1135 and Malabar are very susceptible.

AGEE (H. P.). **The root disease complex of Sugar Cane.**—*Internat. Sugar Journ.*, xxviii, 336, pp. 648–650, 1926.

In this paper, read by the author at the annual meeting of the Hawaiian Sugar Technologists' Association, October, 1926, the

author gives a brief survey of present knowledge of the so-called 'Lahaina' disease of sugar-cane [*R.A.M.*, v, pp. 326, 387], and outlines the work on various aspects of this disease in progress at the Hawaiian Sugar Planters' Experiment Station. Since various factors are considered to be involved in its causation, the terms 'growth-failure' or 'root disease complex' have been substituted for Lahaina disease.

The Lahaina variety of cane, grown in the Hawaiian islands since about 1854, began to deteriorate about 1897 or 1898 in Hawaii itself, the other islands not sharing in this decline for a varying number of years. The same cane, under the names Bourbon, Louzier, and Otaheite had previously given way to hardier varieties in many sugar-cane countries, but that its deterioration was not general is evident from the fact that it still thrives in certain localities and on certain soils. Long before it began to show any signs of decline in Hawaii, it had already been discarded on account of 'deterioration' in the West Indies and other areas. In Hawaii it was to a great extent replaced by Yellow Caledonia, D. 1135, and H. 109. In 1921, however, these varieties began here and there to show similar symptoms to those earlier marked on Lahaina, and this has led to renewed studies of the disease.

The work now in progress shows that there are a number of different agencies in the soil in those areas where failure has been observed which either retard the development of the cane roots or actually destroy them.

Amongst these, soil nematodes have been shown to be active in feeding on and injuring the roots. The other soil fauna [molluscs, centipedes, &c.] that were previously suspected are now regarded as of minor significance. Amongst fungi, the *Pythium*-like species previously found by Carpenter [*R.A.M.*, iii, p. 484] has again been shown to be capable of the destruction of the roots. The soil investigations indicate the importance of saline accumulations in irrigated plantations and of the toxic effects of aluminium in acid soils [but see *R.A.M.*, v, p. 762]. Two or more of these factors acting together might well produce serious results, which might be expected to be accentuated on land that has been under cane for many years. It is noted, however, that even virgin land has not always proved free from the disease.

Previous experience having indicated the value of replacing cane varieties subject to this disease by hardier ones, the Experiment Station has under trial a series of crosses with the Uba and other hardy canes of the Chinese type, some of which offer distinctly encouraging prospects.

[This paper is also reprinted in *The Planter and Sugar Manufacturer*, lxxvii, 18, pp. 347–348, 1926.]

LEE (H. A.), WELLER (D. M.), & BARNUM (C. C.). **Fungus root rots in relation to Lahaina growth failure.**—*Planter and Sugar Manufacturer*, lxxvii, 20, pp. 388–389, 2 figs., 1926.

In describing the injury done by rotting organisms to the roots of Lahaina sugar-cane, the authors distinguish between cortex rots which they do not consider of particular importance to the growth of the cane, and stele rots in which the internal cylinder of the

roots is attacked, leading, in bad cases, to the death of the plant. Microscopical examination failed to show the presence in the material studied of any organisms other than Carpenter's *Pythium* [see preceding abstract] and possibly Lyon's *Chytridium* [*R.A.M.*, iii, p. 484] invading the stele of roots as a primary pathogen. The rot caused by the *Pythium* is easily recognized macroscopically from most other root rots by the aspect of the root tips, which are most commonly affected. Such root tips first exhibit a water-soaked appearance and are slightly more yellow in colour than normal, vigorously growing roots. Later on, the affected root becomes flaccid and translucent, and usually exudes numerous droplets of water. Infection, which apparently may occur without previous traumatic or insect injury, commonly takes place near the tip of the root and spreads upwards. Up to the present the variety H. 109 appears to be resistant to this rot, except, possibly, when the ingress of the fungus is facilitated by some previous injury to the roots; there are indications that the varieties D. 1135, Yellow Caledonia, Uba, Badila, and the Tip canes also have a considerable degree of resistance.

Isolations from cortex rots yielded numerous fungi, among which a very common species of *Fusarium* is regarded as the most dangerous; other fungi found, such as *Thielaviopsis*, *Rhizopus*, *Penicillium*, and *Aspergillus*, are not believed to be of any pathogenic importance, although they are usually associated with cortex rots.

Field observations indicate that aeration of the soil is of some importance in preventing cortex rots, and possibly may also minimize the attacks of the *Pythium* stele rot. Soil disinfectants do not seem promising, as compared with control by means of resistant varieties or by the addition of organic matter to the soil.

KELLY (N. L.). **Bureau of Sugar Experiment Stations. Cane pests and diseases.**—*Queensland Agric. Journ.*, xxvi, 2, p. 115, 1926.

Red rot (*Colletotrichum falcatum*) [*R.A.M.*, vi, p. 53] was the most serious disease of sugar-cane during 1926 in the Mackay district of Queensland.

Mosaic was observed in about 2 per cent. of the farms visited, outbreaks around Farleigh being rather more serious than in North Eton and Sarina. In the Mackay district the disease is spread mainly by the planting of infected setts, secondary infection through the maize aphid [*Aphis maidis*] taking place only where maize, the Shahjahanpur 10 variety of sugar-cane, or the grasses which harbour this aphid abound.

Gumming disease [*Bacterium vascularum*: *R.A.M.*, v, p. 632] was noted in D. 1135 near Dumbleton, and at Lindley Creek, Sarina, and the Sugar Experiment Station at Mackay.

KELLY (N. L.). **Cane pests and diseases.**—*Queensland Agric. Journ.*, xxvi, 4, pp. 281–282, 1926.

In the Herbert River district of Queensland the control of sugar-cane planting, which is vested in the local (Colonial Sugar Refining Co.) mills, is stated to be efficiently handled and to have already

yielded appreciable results, especially in regard to gumming disease [*Bacterium vascularum*]. The latter has been so reduced that there is every indication of the district being freed from it within the next two years, more particularly since the field officers prevent susceptible and sensitive varieties, of which H.Q. is stated to be the worst, from being planted.

Leaf scald [*Bacterium* sp.: *R.A.M.*, vi, p. 120] is reported to be well established in the Tully River district, but the determination of the extent of the infection is rendered difficult by the abundance of top rot throughout the district. One distinguishing feature of the latter disease is that it rarely attacks every stem in a stool, and also the fact that the inside of the stem is sound except near the growing point. A brief description of leaf scald and of its control is given.

FARIS (J. A.). **Some serious Sugar-cane diseases not known to occur in Cuba.**—*Trop. Plant Res. Foundation Bull.* 4, pp. 5–22, 10 figs., 1926.

This is a short paper on eight destructive sugar-cane diseases which have not hitherto been recorded in Cuba. They are: sereh disease, Fiji disease [*Northiella sacchari*], downy mildew (*Sclerospora sacchari*), gummosis [*Bacterium vascularum*], leaf scald [*Bacterium* sp.], dry top rot, smut (*Ustilago sacchari*) [*U. scitaminea*], and rust (*Puccinia kuehnii*). In each case details are given of the cause, symptoms, and geographical distribution of the disease, together with information on control measures. Gummosis is considered most likely to be introduced into Cuba, owing to its presence in Porto Rico, [St. Kitts and St. Lucia: *R.A.M.*, v, p. 518; vi, p. 79].

The importance of exercising care in any introduction of new varieties of canes that might bring in these diseases, and of watching all plantations, especially those that are growing new varieties, for any sign of infectious disease, is emphasized.

SYDOW (H.). **Fungi in itinere costaricensi collecti. Pars secunda.** [Fungi collected on a journey in Costa Rica. Second part.]—*Ann. Mycol.*, xxiv, 5–6, pp. 283–426, 2 figs., 1926.

A detailed description is given of many more of the parasitic fungi, including a number of new species and new genera, collected by the author, during his journey in Costa Rica in 1924–5 [*R.A.M.*, v, p. 330]. Most of the forms described are Ascomycetes and Fungi Imperfecti, morphological and taxonomic notes being given under each species. The collections have added very considerably to the knowledge of the fungus flora of Central America.

LEONIAN (L. H.). **The morphology and the pathogenicity of some Phytophthora mutations.**—*Phytopath.*, xvi, 10, pp. 723–730, 3 figs., 1926.

In this paper the writer demonstrates, by means of saltations of a species of *Phytophthora* from rhubarb (formerly *P. parasitica* var. *rhei*, now included by him in *P. omnivora*) [*R.A.M.*, v, p. 5], the pitfalls which confront the morphological systematist, and points out the need for a classification based on physiological data.

Starting with spores from one sporangium, the writer obtained, in pure cultures, five strains all of which bred true except types I and IV, which were unstable. Inspection of the submerged mycelium showed that types IV and V possessed a fine even mycelium, while the others were characterized by irregular, gnarled, and bulbous hyphae. Types I and II produced oogonia in abundance, type III none at all, and the others sparingly. Similarly the size and shape of the sporangia showed considerable variation. The mode for length in type IV was smaller than that in types I, II, and III by about 27 μ. On green pepper fruits the sporangia usually possessed very prominent papillae as contrasted with the much less pronounced beaks of the sporangia from rhubarb plants. Finally, inoculation experiments showed that types I, II, and IV were strongly pathogenic to rhubarb, while types III and V were comparatively harmless and of no economic importance.

The variations described above, all occurring in one and the same species, indicate, according to the writer, the futility of basing the classification of fungus species on such unreliable characters.

COOK (W. R. I.). **The genus Ligniera Maire and Tison.**—*Trans. Brit. Mycol. Soc.*, xi, 3–4, pp. 196–213, 2 pl., 1926.

The writer, by means of cross-inoculation experiments, proves that five species of *Ligniera*, namely *L. junci*, *L. graminis*, *L. bellidis*, *L. menthae*, and *L. alismatis*, are merely host varieties of the same species, for which the earliest name *L. junci* is retained. This species is said to infect the roots of *Poa annua* and a number of aquatic and semi-aquatic flowering plants in England. *L. pilorum*, previously described from France as a new species on the ground that it caused hypertrophy of the root hairs, is thought by the present writer to be identical with *L. junci*, since it appears that this hypertrophy may be only occasional. Zoospore infection of the root hairs by *L. junci* and the subsequent events leading up to the formation of a spindle-shaped amoeba are described ; penetration by zoospores is thought to be the only method of infection of fresh host plants. The spores are considered as a resting stage to tide the fungus over unsuitable weather conditions, and for propagating it within the cells of the infected plant.

The genus *Ligniera* is regarded as a member of the Plasmodiophoraceae having many affinities with the Mycetozoa. It differs from all other members of the group in not causing hypertrophy of the host tissues.

MASON (E. W.). **On two species of Tolyposporium Woronin recorded on cultivated Sorghum.**—*Trans. Brit. Mycol. Soc.*, xi, 3–4, pp. 284–286, 1926.

The author in this paper discusses the identity and nomenclature of two species of *Tolyposporium*.

Zaprometoff [*R.A.M.*, p. 174] described a smut, *Sorosporium ehrenbergii* Kühn, on sorghum (*Andropogon sorghum*). His specimens were recognized as the same as a smut recorded from Africa and India as *Tolyposporium filiferum* Busse. An inquiry into the history and a comparison of specimens of the two fungi showed

that Kühn and Busse were evidently dealing with the same species, so that on the grounds of priority the name *Tolyposporium filiferum* Busse must be abandoned. On the other hand, the presence of persistent spore balls places the fungus in the genus *Tolyposporium*. The correct name then becomes *T. ehrenbergii* (Kühn) Pat. with the synonyms given above. The fungus is easily recognized by its very large spore sacs (8 to 13 by 3 to 5 mm.), the presence of a number of brown threads in each spore sac in place of a central columella, the aggregation of spores into persistent balls, and the angled spores with a mean diameter of about 12 μ.

Type material of *Tolyposporium volkensii* Henn. from East Africa was found to be identical with a collection from Kenya which was identified as *Cerebella sorghi-vulgaris* Subram., and confirmed by Subramaniam. Henning's species is not a smut but a true *Cerebella*, and possesses a black convoluted stroma with a surface layer of palisade-like conidiophores, each bearing at its apex a conidium with septa in three planes. The correct specific names to apply to the species of *Cerebella* on cultivated sorghum are said to be still somewhat doubtful.

DAVID (P. A.) & ROLDAN (E. E.). **Important diseases of Tobacco in the Experiment Station at Los Baños, and in Northern Luzon, Philippine Islands.**—*Philipp. Agric.*, xv, 5, pp. 287–301, 8 figs., 1926.

The average annual loss from field diseases of tobacco in the provinces of Isabela and Cagayan in northern Luzon from 1920 to 1924 is calculated at not less than 15 per cent. of the total value, giving some idea of the severe and widespread damage caused in the Philippines by these diseases, which appear to become more and more alarming every year. The authors describe briefly the symptoms, nature, cause, and conditions favouring the development of the most common and destructive tobacco diseases of this area, directions for control being given in every case.

Damping off, caused by *Pythium de Baryanum* and *Rhizoctonia* [*Corticium*] *solani* is common in seed-beds and nurseries, the former flourishing in a warm and humid atmosphere [*R.A.M.*, v, p. 753] and the latter at a lower temperature.

Mosaic is very prevalent, the temperature of 27° to 30° C., which favours its development, being maintained in the Philippines during the entire tobacco season.

The bacterial tobacco wilt (*Bacterium solanacearum*) and basal stem rot (*Sclerotium rolfsii*) cause serious damage, although the latter is of infrequent occurrence.

All tobacco fields in the Cagayan Valley and in Los Baños are infected with leaf spot or frog eye (*Cercospora nicotianae*), the only leaf disease described in this paper.

GOLDSWORTHY (M. C.). **Attempts to cultivate the Tobacco mosaic virus.**—*Phytopath.*, xvi, 11, pp. 873–875, 1926.

Conflicting results in regard to the possibility of cultivating the tobacco mosaic virus *in vitro* have been obtained by various

workers [*R.A.M.*, v, p. 524]. The series of experiments described in the present paper was carried out in an attempt to repeat the successful results reported by Olitsky [*R.A.M.*, iv, p. 688]. The virus was secured from diseased tobacco plants, filtered twice through Berkefeld V filters, and kept for 10 days to test its sterility. The culture medium was obtained by mincing, crushing, and filtering normal tobacco leaves, and kept for a similar period for the same reason. The culture tubes, each containing 10 c.c. of the culture fluid, were inoculated with dilutions of 1/100, 1/10,000, and 1/1,000,000 of the virus. Undiluted and diluted tubes were then incubated for 8 days at 30° C. Sets of ten plants were inoculated with undiluted and diluted incubated material, and check plants with a similar dose of distilled water. The results of these inoculations showed that there was a gradual decrease in the number of infections as the dilution increased. Only in two cases out of eight did the 1/1,000,000 dilution give any infection, and when this was diluted still further no mosaic appeared. This seems to indicate that the tobacco virus does not increase in potency when incubated, and to confirm Mulvania's conclusion [*R.A.M.*, iv, p. 689] that it is impossible to cultivate this virus *in vitro*.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, 8, 1926.

BELGIUM. In connexion with the importation of potatoes into Belgium [*R.A.M.*, iv, p. 255], the distance of the nearest centre of infection by wart disease (*Synchytrium endobioticum*) is reduced, as from 13th June, 1925, from 20 to 5 km.

AUSTRIA. In the amended Austrian potato wart [*Synchytrium endobioticum*] order of 28th July, 1926 (superseding that of 24th January, 1926) [*R.A.M.*, v, p. 576], the words 'Bohemia, Moravia, and Silesia only' are omitted (under Czecho-Slovakia) from the list of countries to which import and transport restrictions in potato traffic apply.

Gesetze und Verordnungen. Ungarn. [Laws and regulations. Hungary.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 12, p. 102, 1926.

A Decree of the Minister of Agriculture, dated 2nd July, 1926, enacts that all potatoes imported into Hungary must be accompanied by a duly authenticated certificate vouching for their freedom from wart disease (*Synchytrium endobioticum*), and also for the fact that the latter has not been found within a radius of 10 km. from the place of cultivation. The Decree further prohibits the import of potato consignments showing more than 5 per cent. each of brown tuber rot (*Phytophthora*) [*infestans*] or ring disease [*Bacterium solanacearum* or *Bact. sepedonicum*], or 10 per cent. of joint infection by these organisms.

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McKINNEY (H. H.). **Factors affecting the properties of a virus.**—*Phytopath.*, xvi, 10, p. 753, 1926.

Experiments carried out in Wisconsin with tobacco mosaic showed that diluted virus has a lower thermal destruction point than a concentrated virus and also loses its potency faster on standing at room temperature. When diluted in tobacco juice the potency of the virus and its thermal destruction point were depressed more than when sterile distilled water was used, while cucumber juice produced even more marked effects than tobacco juice. In some cases an increase in potency was found on the 6th and 12th days after dilution, but on standing 50 days there was a decrease of potency below that of any previous point. Further study is necessary to elucidate the reason of these changes in potency of the virus.

McKINNEY (H. H.). **Virus mixtures that may not be detected in young Tobacco plants.**—*Phytopath.*, xvi, 11, p. 893, 1926.

Using an apparently pure mosaic virus in the inoculation of tobacco plants grown at temperatures near 25° C., small yellow spots, one to five mm. in diameter, developed on the older leaves after about three to six weeks. Rarely more than three or four of these appeared on the same plant. Young plants inoculated with the virus from these yellow spots and grown at 25°, showed, in every case, yellow mosaic in from 10 to 12 days after inoculation, while later on green mosaic appeared and predominated over the yellow on the subsequent foliage. When similar plants were inoculated with virus from the green tissue bordering on the yellow spots, a slight amount of yellow mosaic appeared in 10 to 12 days, the green mosaic developing later as before. Only green mosaic, however, appeared when virus was taken from areas more remote

from the yellow spots. Two points of interest arising from the above observations are noted, namely, the suppression of the yellow mosaic in the majority of young plants when the virus is dilute, and the localized concentration of the yellow mosaic virus. The results show that a virus contamination may not be detected when only young plants are used in infection tests. In the case of green mosaic, observations should be carried on over a considerable period in order that any variations in the symptoms may be detected.

MULVANIA (M.). **Studies on the nature of the virus of Tobacco mosaic.**—*Phytopath.*, xvi, 11, pp. 853–871, 1926.

Experiments on the influence of light on the virus of tobacco mosaic showed that the latter is extremely resistant to sunlight. In no case was the virus completely destroyed, although exposure for 36 hours reduced its infectiveness by 90 per cent. Ultra-violet light from a Cooper-Hewett mercury vapour lamp at a distance of six inches inactivated the virus in one hour, but X-rays did not appear to injure it. Similarly, this virus is extremely resistant to heat, since exposure for 20 days at a temperature of 80° C. did not completely destroy it. On a ten minutes' exposure the thermal death point was found to be between 88° and 90°. No relation between the moisture content of the material carrying the virus and the killing temperature was detected.

The tobacco virus was inoculated into the blood stream of rabbits, but attempts to recover it after varying periods from 3 to 30 minutes failed. Subsequently fresh rabbit's blood was found to render the virus inactive. Certain bacteria, when cultivated with the virus, were found to have a very destructive action on it, while others apparently had no effect [*R.A.M.*, v, p. 439].

It was shown that the virus passed through certain grades of collodion sacs and not through others [*R.A.M.*, v, p. 177]. When the reaction of a sac normally impervious to the virus was charged to the acid side of the isoelectric point, the passage of the virus through the sac was effected. An electric current passed through the sac did not cause the virus to dialyse.

As the tobacco virus is relatively resistant to light and heat when contrasted with bacteria, the author is inclined to regard it as rather of the nature of an enzyme than of a bacterium, and thinks that it cannot be a living thing. The fact that an electric current does not increase the movement of the virus through the collodion membrane suggests that the virus must be of a colloidal nature. The theory is put forward that the tobacco virus may be a simple type of protein having the characteristics of an enzyme. It has been suggested that certain animal viruses are globulins. It is even conceivable that there may be certain intermediate stages in the evolutionary path from the non-living to the living in which some of the properties of living matter, e. g. that of reproduction, have been acquired. A body possessed of the property of increasing its quantity by some form of additive process incited by the plant might abstract molecules of the host plant and so progressively disturb the metabolism of the latter.

BREWER (P. H.), KENDRICK (J. B.), & GARDNER (M. W.). **Effect of mosaic on carbohydrate and nitrogen content of the Tomato plant.**—*Phytopath.*, xvi, 11, pp. 843–851, 1926.

Different soil conditions, as afforded by pot experiments with various fertilizers added, were found to have practically no influence on the character or severity of the attacks of two virus diseases of the tomato plant, typical tomato mosaic and the necrotic or double-virus streak or winter blight [*R.A.M.*, v, p. 636]. The evidence for these and the following conclusions was based on the fresh weights, the percentage dry weights, and a chemical analysis of the tomato plants used in the experiments. Consistent and appreciable differences in the chemical constitution of the healthy and mosaic plants were, however, discovered. In all cases there was a marked reduction in the total fresh weight, in the percentage content of dry matter, in the carbohydrate content, and in the carbohydrate-nitrogen ratio of the diseased plants. The reduction in carbohydrate content was due mainly to the lower proportion of polysaccharides. No reduction in nitrogen content was found.

The lower proportion of carbohydrates found in tomato mosaic plants by the writers is a result which is at variance with what has been recorded for spinach and some other mosaic diseases, but is in harmony with the reduced number and degeneration of the chloroplasts recorded in such diseases by Beijerinck, Dickson [*R.A.M.*, i, pp. 77, 392], and others.

YORK (H. H.). **A Peridermium new to the north-eastern United States.**—*Science*, N.S., lxiv, 1664, pp. 500–501, 1926.

The discovery is reported in 1925 of a gall-forming *Peridermium* on the Scotch pine (*Pinus sylvestris*), in a plantation near Woodgate, New York. A careful search made in June and August of the same year and again in 1926 failed to reveal any alternate hosts of this fungus, which is therefore considered to be autoecious in the locality. The galls caused by it resemble those of *Cronartium cerebrum* (Peck) Hedge, and also those of *Peridermium giganteum* (Mayr.) Tub., but both these species are heteroecious, and the former differs in its cerebroid aecidia.

Investigations by the Conservation Commission and the Office of Forest Pathology in the U.S. Department of Agriculture have shown that the new *Peridermium* has spread in plantations of *P. sylvestris* to a distance of 110 miles from the Woodgate focus of infection, and that it is distributed throughout the planted and natural seeded areas. It was further shown that the rust has existed at Woodgate for at least 30 years, and that the amount of infection has increased rather rapidly since 1920. Infection apparently takes place on the current season's wood, through the epidermis of the twigs and stems, and may also occur on the axis where the staminate cones are borne. In 1926 the aecidia began to appear about the middle of May, their production attaining its climax in the first week of June. Viable spores were found in a canker towards the end of August. In the majority of cases the cankers bear their first aecidia the third season following infection, but some galls fructify when only two years old.

WALDIE (J. S. L.). **A die-back disease of Pines.**—*Trans. R. Scottish Arbor. Soc.*, xl, 2, pp. 120–125, 3 pl., 1926.

The Austrian pine (*Pinus austriaca*) has during recent years been widely attacked in Great Britain by a serious die-back disease, caused by *Brunchorstia destruens*. This disease, which has been reported both from wet and dry localities, occurs also on the Corsican pine (*P. laricis*), stone pine (*P. cembra*), mountain pine (*P. montana*), and the Weymouth pine (*P. strobus*). Trees from about six years old upwards are attacked, but so far no cases of infection in the nursery have been observed.

The first symptoms of the disease appear usually from December to March as a rusty brown discoloration of the needles, which starts from the base and works upward; the demarcation from the healthy tissues is ill-defined, and so is distinct from frost damage, which affects the whole of the needle or the upper part only, and is well defined from the healthy tissues. From March till June, the needles are of a brownish colour and later grey or yellowish white, especially the part within the leaf sheath. Infection appears to start at the base of a terminal bud, and as the latter is soon killed the stem dies back for a considerable distance. Both leading and lateral shoots may be attacked, and where the disease is severe the tree may be killed in a few years. Dormant buds frequently develop below the killed portions of the branches, resulting in a growth almost like a witches' broom.

Fungus mycelium is found first in the branches, but later spreads to the needles, on which the fructifications first appear. These are minute, dull black, cushion-shaped pycnidia, with a rough surface, and occur chiefly at the base of the grey needles, from one to seven, but usually two or three, being found on each needle. The pycnidia begin to develop in the autumn and mature in April or May. Considerably larger, but otherwise similar pycnidia occur on the branches. The conidia are crescent-shaped, seldom straight, narrowing towards the ends, usually triseptate, colourless, and average 40 by 3 μ in diameter. They are exuded as white, tendril-like masses in May and June. Germination takes place after 36 hours in water. The fungus grows readily on agar media, producing a white, fluffy, superficial mycelium, but no spores.

It is recommended that before planting any area with a susceptible species of pine, all Austrian pines in the neighbourhood, even if not obviously infected, should be cut down and burnt, especially where pure plantations of the Corsican pine are being planted.

DE KONING (M.). **Roest op Weymouth.** [Blister rust of the Weymouth Pine.]—*Tijdschr. over Plantenziekten*, xxxii, 11, pp. 314–315, 1926.

The author points out the great reluctance on the part of many Belgian silviculturists to give up the cultivation in Belgium of the Weymouth pine [*Pinus strobus*] as a consequence of its susceptibility to attacks of *Peridermium strobi* (*Cronartium ribicola*). Moved by public demand, the Belgian Forestry Council discussed the question at a meeting in 1925, and came to the conclusion that the eradication of this tree was undesirable owing both to its ornamental and industrial value. The measures recommended for im-

proving the cultivation of the trees and for controlling the disease are that seedlings should be raised from seed obtained from healthy pines and bred in special nurseries under phytopathological control. In such nurseries all diseased seedlings should be removed during the winter, and the remainder should be sprayed with Bordeaux mixture. The Council stresses the necessity of studying strains of the Weymouth pine for resistance to the disease in countries where climatic conditions approach those that obtain in Belgium, with the restriction that only seed from immune or but little susceptible strains should be allowed to be imported.

DAY (W. R.). **The parasitism of Armillaria mellea in relation to Conifers.**—*Quart. Journ. of Forestry*, xxi, 1, pp. 9–21, 3 pl., 1927.

In these studies on the penetration of *Armillaria mellea* into the host the author made his observations on healthy and vigorous trees of several species and genera including *Pinus*, *Thuja*, larch [*Larix*], Douglas fir [*Pseudotsuga taxifolia*], and Norway spruce [*Picea excelsa*].

The fungus was found to follow the same method of attack in each case. The first stage consists of the attachment of the rhizomorphs of the fungus to the bark of the host, frequently at the root collar within six inches of the soil surface, the attachment taking place by the hyphae of the rhizomorph growing into the dead cork cells and forming a mycelium therein without entering the living tissue, often fixing it so firmly that it takes considerable force to detach it. Small trees are frequently encircled with rhizomorphs at the collar and these grip the trees so tightly that the bark may be furrowed. Where a rhizomorph meets the host directly, a whorl of branches may develop and all become attached to the host.

As a preliminary to penetration the fungus appears to exert a toxic influence on the tissues of the host in advance of its mycelium. If the host has sufficient vitality it almost always forms one or more secondary cork layers to prevent, if possible, the entry of the fungus, and a distinct feature in many cases is the formation of deep invaginations lined with series of cork layers. Even where there is no sign of secondary cork layers there is often evidence of abnormal growth, which must have taken place before penetration.

The author concludes from his observations that *A. mellea* is able to penetrate an uninjured and apparently healthy tree. The fungus cannot be regarded as a virulent parasite without further proof, as trees attacked by it do not always die and susceptible species in close proximity to the parasite may show no signs of the disease. The less thrifty trees may ultimately prove to be the more frequently attacked, but often some of the best and strongest growing trees are killed by the fungus. Certain species and genera appear fairly consistently to be more susceptible than others, but several exceptions are quoted where susceptible species have been shown to be resistant, even where a virulent strain of the fungus was present, whilst the more resistant species were sometimes attacked though not killed with the formation of cankers due to the fungus at the base of the stem. The author is inclined to

think that external factors have a greater influence in determining the intensity of infection and general susceptibility than any inherent qualities of the species.

ROBINSON (R. L.). **Mortality among Oak.**—*Quart. Journ. of Forestry*, xxi, 1, pp. 25–27, 1927.

An excessive mortality of oaks in the south of England has occurred during the last few years, following serious attacks by the oak roller moth (*Tortrix viridana*) which during the war and up till 1924 was unusually abundant. This insect causes the defoliation of the leaves in early summer, and in due course the tree puts out new leaves which have been found to be very susceptible to attack by the oak mildew (*Oidium quercinum*) [*Microsphaera quercina*]. Where the attack is severe, recovery of the tree and ripening of the wood are said to be retarded.

In 1923 and 1924 oaks began to die in alarming numbers and extensive fellings had to be made; but by this time the trouble had reached its worst, and by 1925–6 many sickly oaks kept under observation showed a decided improvement, with the disappearance of the *Tortrix*.

A noticeable feature about the dead trees was the development of *Armillaria mellea*, which extended right up the trunks, and the author draws attention to the similar state of affairs in Yugo Slavia [*R.A.M.*, v, p. 705; vi, p. 5] where defoliation by insects has been followed by mildew and finally by *A. mellea*, which has completed the destruction of many of the trees.

OSMASTON (L. S.). **Mortality among Oak.**—*Quart. Journ. of Forestry*, xxi, 1, pp. 28–30, 1927.

The author considers that mortality among oaks in England [see preceding abstract] is due to a combination of the following factors, namely, defoliation by caterpillars [*Tortrix viridana*], attacks by the oak mildew (*Microsphaera quercina*) and the honey fungus (*Armillaria mellea*), and bad silvicultural conditions. In practically every case where sickly oaks were examined rhizomorphs of *Armillaria mellea* were found attacking the roots and in many cases it is thought to be the immediate cause of death. Trees already weakened by defoliation and attacks of mildew are liable to attack by the fungus, which, rapidly destroys the sap wood and thus reduces the value of the timber. Mortality occurs among trees of all ages from 20 to 150 years. The sessile oak [*Quercus sessiliflora*] seems to be considerably less liable to injury by insects than the pedunculate [*Q. pedunculata*], whilst the Turkey oak [*Q. cerris*] has not been observed to be attacked, either by the insects or by mildew.

Preventive measures suggested include the improvement of silvicultural conditions, early interplanting with beech, the protection of nursery plants from defoliation and mildew, and regeneration with sessile rather than pedunculate oak.

GEORGÉVITCH (P.). **Ceratostomella querci n. sp.**—*Comptes rendus Acad. des Sciences*, clxxxiii, 18, pp. 759–761, 1926.

The author briefly describes a new species of fungus which is

stated to be frequently found filling the peripheral vessels of the sap wood of oak (*Quercus pedunculata*), to which it imparts a dark grey discoloration. The fungus is found in the vessels chiefly in the form of a *Graphium*, the fructifications of which arise either singly or in groups from a brown mycelial weft of hyphae, 1·7 to 3 μ thick, and attain from 260 to 285 μ (in artificial cultures up to 619 μ) in length by 120 μ or more in diameter. The conidia abstricted from the top of the capitulum are elliptical or oval, hyaline, 4 by 2 μ in diameter. In pure culture the conidia germinate in 24 hours by one or two germ-tubes which may form secondary conidia of the *Cladosporium* type. Besides this form, there also occur in the vessels perithecia, identified by the author as belonging to a *Ceratostomella* which is regarded as a new species and named *C. querci*. The perithecia consist of a spherical basal part, averaging 129 μ in diameter, and a beak of variable length and averaging 22 μ broad. In culture the perithecia are 970 to 990 μ long; their basal part is 150 to 240 μ in diameter, and the beak 14 to 27 μ broad. At the top of the beak arises a crown of setae, up to 315 μ long and 5 μ thick, around which the ejected ascospores are suspended in a drop of hyaline, viscous liquid, dissolving neither in water nor in alcohol. The asci are spherical, 6 to 8 μ in diameter, and contain 8 reniform ascospores, 4 by 2 μ when mature. The latter germinate within 24 hours, either at one or both ends, giving rise to a septate, branching mycelium, from which conidia of the *Cladosporium* type are abstricted. Cultures on bread, agar and wood gave rise to *Graphium* heads and established the genetic connexion between the two forms.

LÜSTNER (G.). **Häufigere Perithecienbildung beim Eichenmehltau, Microsphaera alni extensa (Cooke et Peck) Salm. = M. quercina (Schwein.) Burr.** [More frequent perithecial formation by the Oak mildew, *Microsphaera alni extensa* (Cooke et Peck) Salm. = *M. quercina* (Schwein.), Burr.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 11. pp. 89–99, 1926.

On 26th September, 1926, the writer first observed, in the Taunus Mountains, near Wiesbaden, the occurrence of the perithecial stage of oak mildew (*Microsphaera quercina*), a stage which was first seen in Germany in 1920. In the centre of the perithecial groups (of which one to six were found on each of some forty leaves), the perithecia were mature and black, while the outer, immature ones were yellow and brown. The diameter of the individual groups was generally 0·5 cm. The perithecial stage of *M. quercina* was also found on 9th October at Geisenheim [Rhine], some of the asci in this case containing eight ascospores. As regards perithecial formation *M. quercina* is evidently following the same course as *Uncinula necator*.

PAPE (H.). **Perithecien des Eichenmeltaues (Microsphaera alni extensa [Cooke et Peck] Salm. = M. quercina [Schwein.] Burr.).** [Perithecia of the Oak mildew (*Microsphaera alni extensa* [Cooke et Peck] Salm. = *M. quercina* [Schwein.] Burr.).]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 12, p. 98, 1926.

In connexion with Lüstner's paper on the increasing frequency of

the perithecial stage of oak mildew (*Microsphaera quercina*) in Germany [see preceding abstract], the writer mentions the receipt, by the Biologische Reichsanstalt, of two further specimens, one from Saxony and the other from Pomerania. The diameter of the perithecia, which occurred in groups of 40 to 50 on the upper side of one of the leaves from the latter region, was 113 to 140 μ. Asci with eight ascospores, as well as those containing three or four were of frequent occurrence.

NICOLAS (G.). **Un nouvel hôte de Ganoderma applanatum (Pers.) Patouillard.** [A new host of *Ganoderma applanatum* (Pers.) Patouillard.]—*Bull. Soc. Myc. de France,* xlii, 1 & 2, pp. 190–191, 1926.

Ganoderma applanatum, of which a list of synonyms is given, is recorded on mulberry trees near Toulouse. It occurs frequently on beech, oak, ash, poplar, and cherry, and occasionally on many other trees, but the mulberry is stated to be a new host.

NICOLAS (G.). **Un nouvel hôte d'Ungulina fraxinea (Bull.).** [A new host of *Ungulina fraxinea* (Bull.).]—*Bull. Soc. Myc. de France,* xlii, 1 & 2, pp. 192–193, 1926.

Fomes fraxineus (Bull.) Fr. (= *Ungulina fraxinea* Bourd. & Galz.) shows a much wider host range than the closely allied *Fomes ulmarius.* The author has observed it on the elm at Toulouse and this is thought to be the first record of its occurrence on this host.

GARD (M.). **L'Armillaria mellea Vahl. produit deux sortes de pourridié chez le Noyer (Juglans regia L.).** [*Armillaria mellea* Vahl. produces two kinds of root rot of the Walnut (*Juglans regia* L.).]—*Rev. Path. Vég. et Ent. Agric.,* xiii, 2, pp. 183–185, 1926.

The author briefly describes, as distinct from the usual cortical root rot of the walnut caused by *Armillaria mellea,* a deep-seated rot of the woody parts of the tap root and base of the stem caused by this fungus in the Sarladais and Cantal [southern France] in soils that easily absorb and store heat from the atmosphere. The carpophores of this strain differ by their deeper colour and a shorter and stouter stipe from those that arise from the usual rot organism. Some morphological differences were also noted in pure cultures of the mycelium of the two strains.

JACZEWSKI (A. A.). Буреломы и ветровалы в связи с грибными паразитами лесных пород. [Breakage and uprooting of forest trees in relation to parasitic fungi attacking them.]—Reprinted from *Материалы по Микологии и Фитопатологии* [*Materials for Mycology and Phytopathology*], Leningrad, part I (*1926*), 18 pp. 3 figs., 1926.

The author states that, according to its own observations and to data in European and American literature [a cursory review of which is given], parasitic fungi play an important part in the damage done to forest trees by gales, either by rotting the root system in which case the trees are uprooted without breaking, or by inducing stem rots which render the trees liable to be broken by

the wind. From a survey made in the woods surrounding Peterhof [near Leningrad], it was found that out of 77 fir trees either broken or uprooted, 85 per cent. exhibited evident symptoms of root rot (chiefly *Polyporus* [*Fomes*] *annosus*, but occasionally also *Armillaria mellea* or *P. schweinitzii*) or of stem rots (in the majority of cases *Trametes abietis*, occasionally *P.* [*Polystictus*] *abietinus*). In a few cases a mixed infection of the trees was noted, the stems being attacked by *T. abietis* while the roots were rotted by *F. annosus*; the latter was also found in two cases growing together with *A. mellea*. A few of the broken firs suffered from a central rot of the stem caused by *Daedalea borealis*. Other species of trees damaged by wind showed attacks by the following fungi: *Polyporus* [*F.*] *fomentarius* on birch; *P.* [*F.*] *igniarius* on birch, mountain ash, alder, maple, elm, willow, and white poplar; *P. sulfureus* on oak; and *P. schweinitzii* on larch [*Larix*].

JØRSTAD (I). **Innberetning fra statsmykolog om sykdommer på skogtraerne i årene 1920–1925.** [Report of the State Mycologist on diseases of forest trees in the years 1920–1925.]—*Innberetning om Det norske skogvesen for året 1925*, pp. 85–95, Skogdirektören, Oslo, 1926.

In this survey the writer summarizes his observations on the more important diseases occurring in Norwegian forests during the period 1920–25 [see also *R.A.M.*, v, p. 196].

Melampsora pinitorqua, which overwinters on aspen [*Populus tremula*] leaves, caused heavy infection among three-year-old Scotch fir [*Pinus sylvestris*] trees in 1921, while a number of attacks were also reported in 1924.

Cronartium pini, of which the pine stage is usually known as *Peridermium pini* f. *corticola* [loc. cit.], usually appears to be restricted to *P. sylvestris*, but in 1925 it was also observed on French mountain pine [*P. montana gallica*] in Fana. In the south-east of Norway the *Cronartium* stage was noticed to occur on *Vincetoxicum officinale* and especially on peony in 1924.

Blister rust (*Cronartium ribicola*), besides having devastated almost the entire stand of Weymouth pines [*P. strobus*] in Norway, has also attacked *P. flexilis* in one district, while *P. cembra* seems to be very resistant. In addition to black currant [*Ribes nigrum*], *R. aureum* and other cultivated species have been found to be infected by the *Cronartium* stage: *R. alpinum*, on the other hand, appears to be highly resistant. Black currants were heavily attacked in the vicinity of white pine in 1924 and 1925.

Coleosporium pini, of which the pine stage is usually known as *P. pini* f. *acicola*, is a collective species comprising a number of biological strains occurring on some 23 alternate hosts. Of these, however, only *Melampyrum pratense*, *M. sylvaticum*, and apparently in some districts *Euphrasia officinalis* act as sources of infection to the pine. The aecidial stage on pine needles seems to be chiefly annual.

Dasyscypha subtilissima produces conspicuous, deep cankers on *P. sylvestris*, *P. montana*, and *P. murrayana*, the last-named being particularly susceptible. In one case observed in 1925 the fungus occurred in association with a borer insect, which had spread from

a neighbouring saw mill. *D. resinaria*, which is stated to be microscopically indistinguishable from the foregoing, was found in 1924 on *P. sylvestris*.

Crumenula pinicola is responsible for more damage than has hitherto been realized to *P. murrayana*, *P. strobus*, and *P. sylvestris*. *Cucurbitaria pithyophila* seems chiefly to attack poorly developed pine trees and no evidence of serious injury from this cause has been observed. *Cenangium abietis* was reported from several localities on *P. sylvestris*, *P. montana*, and *P. murrayana*. *Phacidium infestans*, which only develops under a heavy covering of snow, has not occurred in an epidemic form since 1916. In mountainous districts this fungus often causes very heavy damage to young stands of *P. sylvestris*.

Notes are also given on the diseases of *Pinus* spp. caused by various Polyporaceae, and on those of spruce [*Picea*], larch [*Larix*], and various broad leaved trees.

WEIMER (J. L.). **A leaf spot of Cruciferous plants caused by Alternaria herculea.**—*Journ. Agric. Res.*, xxxiii, 7, pp. 645–650, 2 pl., 1 fig., 1926.

During the winter of 1923–4 a leaf spot of cabbage and cauliflower due to *Alternaria herculea* (Ell. & Mart.) Elliott [which name the author states in a footnote he prefers to *A. brassicae* (Berk.) Bolle: *R.A.M.*, iv, p. 61] was prevalent in the Colma district near San Francisco, in addition to ring spot (*Mycosphaerella brassicicola*): [ibid., v, p. 459] and black leaf spot (*A. brassicae* (Berk.) Sacc.) [ibid., iv, p. 324]. The spots caused by *A. herculea* resemble the other two spots in being circular and concentrically ringed but are lighter in colour and spore production is scanty except in very humid weather; the term grey spot is proposed for the disease. The spores are much larger (125 to 225 by 16 to 28 μ) than those of *A. brassicae*. The parasitism of the fungus on cabbage, cauliflower, Chinese cabbage [*Brassica pekinensis*] and rutabaga [*B. campestris*] was proved by inoculations with mycelium from pure cultures. Inoculations also indicated that a slow decay of cauliflower heads may result at temperatures of 0°, 2°, 4·5°, 9°, and 20° to 25° C.; the decay is, however, too slow at the lower temperatures to cause appreciable damage to cauliflowers transported in refrigerator cars. The injury done to the leaves in the field does not appear to be severe enough to call for direct measures of control.

GOLDSWORTHY (M. C.). **Studies on the spot disease of Cauliflower; a use of serum diagnosis.**—*Phytopath.*, xvi, 11, pp. 877–884, 1926.

The spot disease of cauliflower (*Bacterium* [*Pseudomonas*] *maculicolum*) [*R.A.M.*, iii, p. 565] is of considerable economic importance in the San Francisco Bay region of California. It tends to attack over-mature heads, and also to develop after injury. Sharp frosts even if not sufficient to cause blackening of the tissues seem to induce an injury which favours infection. The cultural characters and biological activities of the causal organism are described and are stated to agree closely with those given in the

original description by McCulloch. In order to determine whether the organism is a soil dweller a series of soil inoculations in sterilized and unsterilized soil was made, samples being removed at intervals and the presence or absence of the organism being determined by the use of agglutinating antibodies. High titre antiserums were produced by injecting *Ps. maculicolum* into the blood stream of rabbits. Identification of the isolated organisms was made by agglutination at high dilutions of the specific antiserum. Thus the recognition of the bacterium was easy and absolute. The results of these experiments showed that *Ps. maculicolum* can persist in flasked dry soil for at least a year. Different samples of soil not cropped with crucifers showed the presence of the organism of spot disease in 28 out of 187 samples. The red-bordered stink bug (*Euryopthalmus convivus*) was found to carry the bacterium on its extremities, and thereby to act as a disseminating agent.

BURKHOLDER (W. H.) & MULLER (A. S.). **Hereditary abnormalities resembling certain infectious diseases in Beans.**—*Phytopath.*, xvi, 10, pp. 731–737, 2 figs., 1926.

This paper contains descriptions of two striking abnormalities of the bean (*Phaseolus vulgaris*) which have been observed in New York State.

The first is characterized by the presence of small light yellowish areas on the leaves and is termed 'pseudo-mosaic'. The second is a seedling wilt; apparently normal seedlings gradually sicken, the two first leaves become pale, curl up, drop off, and the plant generally dies. Failure to find a causal organism or infective principle in either case led to a genetical study of the two conditions. Both were found to be transmitted only to the progeny of affected plants, and then as recessive characters, two factors being involved in each case.

SANDS (D. R.). **Experiments for the control of Onion smut.**—Abs. in *Phytopath.*, xvi, 10, p. 758–759, 1926.

These experiments for the control of onion smut [*Urocystis cepulae*], said to be causing considerable losses in the onion growing marshes of south-western Ontario, were carried out in order to find a fungicidal solution which would give the best results with the minimum amount of water. The data obtained showed that when about the same quantity of formalin or kalimat [*R.A.M.*, iv, p. 251] was used per acre, the best results were produced when the greatest amount of water was used. One pint of formalin in 16, 12, or 6 imperial galls. of water used at the rate of 130, 100, or 50 galls. per acre, respectively, resulted in yields of 568, 540, and 450 bushels per acre. Similarly 1 pint of kalimat in 12 or 6 galls. of water at 100 or 50 galls. per acre, respectively, resulted in yields of 522 and 440 bushels per acre. The controls yielded only 198 bushels per acre.

HANSEN (H. N.). **'Pink-root' of Onions caused by Phoma sp.**—*Science*, N.S., lxiv, 1665, p. 525, 1926.

With reference to the causal organisms of the pink root disease of onions [*R.A.M.*, i, p. 405; iii, p. 693], the author states that in

California the extent and diversity of the cryptogamic flora isolated from diseased onion roots largely depends on the condition and treatment of the material used. If the decay is far advanced, a large number of species of *Fusarium* and other soil fungi is obtained, but if the roots, though distinctly discoloured, are still turgid, the number of fungi which develop is greatly reduced. By treating such roots with a 1 in 500 solution of mercuric chloride for three minutes, he isolated from them only one fungus, which is identified as a member of the genus *Phoma*. Its pycnidia are subglobose, gregarious, dark brown to black, 170 to 250 μ; the conidia are oblong, hyaline, one-celled, 3 to 3·5 by 1·2 to 1·5 μ in diameter, escaping as a gelatinous cirrus. Typical symptoms of the disease were readily reproduced when onion seedlings were grown in sterilized soil inoculated with this fungus, and it was re-isolated in pure culture from the affected parts.

WALKER (J. C.). **The influence of soil temperature and soil moisture upon white rot of Allium.**—*Phytopath.*, xvi, 10, pp. 697–710, 2 pl., 1926.

White rot of onions (*Sclerotium cepivorum*), although of widespread occurrence in Europe, has only fairly recently been recorded in America [*R.A.M.*, iv, p. 13]. Owing to the threatened danger to onion growing areas in the United States, the author undertook an investigation of the influence of environmental factors on this disease, the first results of which are described in this paper.

Cultures of various strains from both Europe and America on potato-dextrose agar exposed to different temperatures, showed that in every case growth occurred from below 5° to about 29° C. The most rapid development took place between 20° and 24°, but it was nearly as great at 15° to 20° after a somewhat longer time.

Pot experiments in which young onion plants were grown in inoculated soil, and held at temperatures varying from 8° to 30°, showed that infection occurred readily, and the disease progressed most rapidly at soil temperatures between 10° and 20°. Above 20° there was a marked reduction in infection, and at 24° the disease did not occur. Further experiments showed that the most rapid growth of the onion roots occurred at 22°, so that the critical point at which infection ceased, is not that at which there is an evident check in the growth of the fungus in pure culture, but that at which the host is growing most vigorously.

The effect of soil moisture on the disease was investigated by growing onion plants in pots containing inoculated soil, of which the moisture content varied in the different pots from 20 to 80 per cent. of the water-holding capacity, the temperature being held at 15° to 20°. The greatest development of the disease was found at 40 per cent.; at 20 per cent. the growth of the host was very slow and the amount of disease was reduced, while at 60 and 80 per cent. the host grew more rapidly, but the amount of infection was much diminished.

Under natural conditions, the writer points out, variations in soil moisture probably have a direct effect on the occurrence of the disease. With regard to soil temperature, certain localities where onions are grown, offer more favourable conditions than others

For example, in the northern onion-growing districts of the United States, the crop is subjected to temperature conditions ideal for white rot, while later in the season the soil temperature is above the point most favourable to disease development. In the southern States onion crops are sown in winter and the soil temperature is favourable for a much longer period, and here white rot has already become an established disease.

STIRRUP (H. H.) & ROEBUCK (A.). **Parsnip canker.**—*Journ. Min. Agric.*, xxxiii, 9, pp. 824–826, 2 figs., 1926.

During the season 1924–5 a high percentage of late-lifted parsnips in the Melbourne district of Derbyshire were ruined by canker.

The first manifestations of the disease are horizontal cracks in the root, at or near ground level, followed by rupture of the skin exposing the cortical tissues. Later, an orange brown rots sets in, probably owing to the entry of fungi, turning to a black soft rot which finally destroys the whole root.

Prevention of cracking by careful management of soil, tilth, and moisture to promote regular growth, and a search for resistant varieties are suggested as control measures. In investigations during the season 1925–6, with the latter end in view, it was found that considerable differences in varietal liability to cracking exist, Large Guernsey and Tender and True being only slightly affected, while Elcombe's Improved and Yates' Eversham were severely cracked, and the other varieties tested were intermediate. These results require to be confirmed by further tests.

Leaf spot of Celery.—*Journ. Min. Agric.*, xxxiii, 10, pp. 963–964, 1927.

Leaf spot disease of celery (*Septoria apii*) often causes serious losses [in England and Wales] where it has increased considerably during recent years. The disease is frequently overlooked until the plants reach maturity, but infection may be found in the seedling stage. Although the disease may, perhaps, be transmitted from an old to a new crop by infected material from a previous diseased crop, it is generally seed-borne, and arrangements have been made for the examination of celery seed for the presence of the causal fungus at the Official Seed Testing Station, Cambridge, where samples (containing at least 100 seeds and accompanied by a fee of 2*s.* for each sample) may be sent.

It is also suggested that purchasers of celery seed might ask for a written guarantee that it has been found free from the fungus by a competent expert.

NICOLAS (G.) & DOP (P.). **Un parasite du Melon de Malabar.** [A parasite of the Malabar Melon.]—*Bull. Soc. Myc. de France*, xlii, 1 & 2, pp. 194–195, 1926.

The leaves of the cucurbit *Cucurbita ficifolia* Bouché (*C. melanosperma* A.Br.), at Toulouse, developed spots attributed by the authors to *Epicoccum nigrum* Link. The disease appeared in August, and caused such damage that large areas of the leaves

were perforated with holes and withered, and the crop was much reduced.

It was found that while the majority of the conidia of the fungus were one-celled, a number developed five or six septa, thus lending support to the suggestion that this fungus belongs to the group of fungi with muriform conidia. The fungus is under study in its morphological and biological aspects.

HARRISON (R. M.) & WARE (W. M.). **Downy mildew of the Vine again in England.**—*Gard. Chron.*, lxxx, 2084, pp. 448–449, 3 figs., 1926.

A case of downy mildew (*Plasmopara viticola*) was observed in August, 1926, on a vine growing in the open at Wye, Kent. The disease was already far advanced, and a month later almost every leaf and bunch of grapes was affected. Oospores were produced in abundance in September. The symptoms of the disease and the life-history and distribution of the fungus are briefly described.

In view of the fact that there is but little vine cultivation in England, the outbreak is not considered serious, but it is interesting to note that it is apparently only the second record of downy mildew in this country the first having been made in 1894.

The affected vine was cut down and burned.

EYLES (F.). **Two diseases of the Vine.**—*Rhodesia Agric. Journ.*, xxiii, 10, pp. 929–932, 1926.

The author states that *Uncinula spiralis* [*U. necator*] causing powdery mildew of the vine, is common in Rhodesia in the imperfect stage, *Oidium tuckeri*. Two or three dustings with sulphur and finely powdered slaked lime (in the proportion of 3 to 1) [*R.A.M.*, iii, p. 120] are recommended for its control. Sulphur emits fumes destructive to the fungus at temperatures ranging from 75° to 100° F., these being also favourable to the growth of the organism. It is advised, therefore, to commence the applications of sulphur as soon as the temperature at the hottest time of the day reaches 75°. Over 100° the organism ceases to grow except in moist situations, when the sulphur should be sprinkled on the ground as it may cause injury to the vines if the daily temperature reaches 110°. When weather conditions are unfavourable (cold, wet, or windy), a liquid lime-sulphur spray (1 part to 40 of water) or 6–4–50 Bordeaux mixture may be used.

Anthracnose (*Gloeosporium ampelophagum*) often causes serious injury to Rhodesian vines, occurring principally on the shoots and berries. The application of a solution of 4 per cent. sulphuric acid in water during the winter, when the vine is leafless, is recommended for the control of this disease.

VERESCIAGHIN (B.). **Les maladies de la Vigne en Bessarabie Centrale en 1926.** [Vine diseases in Central Bessarabia in 1926.]—*Rev. de Vitic.*, lxv, 1692, pp. 365–367, 1926.

Climatic conditions in Bessarabia are stated to have been very favourable in 1926 to the development of fungal diseases of the vine, especially of mildew [*Plasmopara viticola*] which almost entirely destroyed the harvest in vineyards that were not sprayed

with Bordeaux mixture. Those sprayed with Bordeaux mixture 15 days before flowering and again after flowering gave a full yield, with the exception of the more susceptible varieties, such as Chasselas, which lost up to 10 per cent. When spraying was delayed to within less than a fortnight before flowering, it was not effective. In sprayed vineyards the leaves bore on the underside irregularly polygonal, greyish spots with numerous black pycnidia attributed by the author to *Phoma flaccida* [*R.A.M.*, v, p. 145] or to *Phyllosticta succedanea*. Other diseases noted were excoriosis [ibid.], white rot (*Charrinia diplodiella*) [*Coniothyrium diplodiella*], a green spotting due to *Alternaria vitis*, the berry rot caused by *Guignardia* [*Physalospora*] *baccae* [ibid., i, p. 102], another disease of the berries, identical with that termed 'sclériase' by Viala and Marsais, and caused by *Sordaria uvicola*, and the grey rot caused by *Botrytis cinerea* which accompanied the attacks of *Cochylis* [*Clusia*] *ambiguella*.

SERGENT (E.) & ROUGEBIEF (H.). **De l'antagonisme entre les drosophiles et les moisissures.** [On the antagonism between *Drosophilae* and moulds.]—*Comptes rendus Acad. des Sciences*, clxxxii, 20, pp. 1238–1239, 1926.

The experiments briefly described in the present note were carried out in 1925 with a view to ascertaining the part played by insects in the control of moulds that develop on ripening grapes in the field, as in preliminary experiments in 1923 and 1924 it had been noted that moulds grew but sparsely and with difficulty on grapes visited by insects, while abounding on those that were kept out of the reach of the latter. The results showed that the grapes from plants isolated from any access of insects were heavily attacked by moulds and did not subsequently ferment, while those from plants equally isolated but to which *Drosophila* species were introduced during the period of maturation, presented a very spare and poor development of moulds and fermented very rapidly. The action of the insects is attributed by the authors partly to the fact that their larvae feed on the moulds, but chiefly to the yeasts which they carry and with which they contaminate the surface of the fruit. These yeasts multiply and compete with the moulds, the development of which is hindered and finally suppressed.

MCRAE (W.). **Report of the Imperial Mycologist.**—*Sci. Repts. Agric. Res. Inst. Pusa, 1925–26*, pp. 54–69, 1926.

The study of the influence of fertilizers and soil conditions on wilt of 'rahar' [pigeon pea] (*Cajanus indicus*) due to *Fusarium vasinfectum* was continued [*R.A.M.*, v, p. 212]. The average number of wilted plants in the three plots receiving superphosphate was four times that in the five without superphosphate. In the farmyard manure plot, the number was seven times the average of these five plots, and in the green manure and superphosphate plot six times. It seems, therefore, that green manure does not always reduce wilt in a plot receiving only superphosphate. Experiments on the lateral spread of the disease showed that in unmanured land, 9, 43, and 88 per cent. of infection occurred in three successive years in the plot next to the infected one, but in plots manured

with superphosphate contradictory results were obtained. It was again shown that the bulk of infection comes from the fungus in the soil, and not from spores on the seed. The amount of wilt appears to be influenced by the retentive nature of the soil but not directly by its water content.

Mosaic disease of sugar-cane [*R.A.M.*, v, p. 695] was found for the second time in Pusa and other areas of Bihar. The varieties Co. 232, Red Mauritius, Purple Mauritius, Maur. 16, B. 6308 and A. 2 were fully infected with the disease.

Experiments on the temperature relations of the cotton wilt fungus (*Fusarium* sp.) [*F. vasinfectum*], showed that on liquid and solid media the maximum amount of growth occurred between 25° and 30° C., and the thermal death point was near 40°.

The results of inoculating berseem (*Trifolium alexandrinum*) with *Rhizoctonia solani*, *Vermicularia* sp., and *Fusarium* sp. again gave positive results only with the first-named, by which 71 per cent. of the plants inoculated were killed. Seedlings were found to be more susceptible than older plants.

Tests of resistance of gram [*Cicer arietinum*] to wilt (*Fusarium* sp.) carried out by artificial inoculation gave negative results, while in naturally infested soil 17 out of the 25 types of gram tested were found to be susceptible.

The study of linseed wilt (*Fusarium lini*) revealed the parasitic nature of this fungus. The maximum temperature for growth lies between 25° and 30°, and the thermal death point is near 37° or 38°. In a test for varietal resistance, type 121 and Sabour appeared to remain free from attack.

Mustard smut (*Urocystis corraloides*), observed in one plot near Pusa in 1921, still continues to appear year after year but has not spread to any other plot in the vicinity. Spores of the fungus were found to be extremely difficult to germinate and to be apparently incapable of infecting mustard seed.

The morphology of two species of *Helminthosporium* on ginger [*Zingiber officinale*] and *Panicum frumentaceum*, respectively, was studied, and cross inoculation tests showed that both attack various grasses in addition to their own host plants [*R.A.M.*, iv, p. 331].

HURST (R. R.). **Report of the Dominion Field Laboratory of Plant Pathology, Charlottetown, P.E.I.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 20–29, 1 fig., 1 graph., 1926.

During the year 1925, stem rust of wheat (*Puccinia graminis*) is stated to have been only moderate on the most popular varieties in the Prince Edward Island, but Little Club and Marquis showed heavy infection. Leaf rust [*P. triticina*] did serious injury.

Nine varieties of flax were tested for their susceptibility to 'browning' and 'stem-break' (*Polyspora lini*) [*R.A.M.*, i, p. 116; ii, p. 176]. The disease appeared only on Riga Blue and Saginaw early in August, when typical 'stem-break' developed, while the 'browning' condition did not occur under the damp, warm weather which prevailed during the growing season.

An epidemic outbreak of blight of tulips (*Botrytis tulipae*) [*R.A.M.*, v, p. 557] occurred in one bed in the Charlottetown

Experimental Station, where it had already been observed in 1918. For the control of the trouble, the immediate destruction of diseased material and the avoidance of planting tulips in infected beds are recommended.

Results obtained in 1925 confirmed that seed treatment is ineffective in the control of black scurf (*Corticium vagum*) [*C. solani*] on potatoes in infected soil. Early harvesting either just prior to or immediately after maturity is recommended, where this disease is a factor to be considered. Preliminary experiments showed that the method of adding ¼ oz. of mercuric chloride to the steep after treating four bushels of seed potatoes, in order to maintain the solution at the initial strength of 100 gm. of mercury chloride to 22½ gallons of water, is of doubtful efficacy, and indicate the necessity of adding larger amounts to maintain the fungicidal action of the treatment.

Late blight (*Phytophthora infestans*) and early blight (*Alternaria solani*) are stated to have been very prevalent in the year under review, while powdery scab (*Spongospora subterranea*) was very slight throughout the province, evidently owing to the dry weather which prevailed.

HOCKEY (J. F.). **Report of the Dominion Field Laboratory of Plant Pathology, Kentville, N.S.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 29–42, 1 fig., 1 graph., 1926.

In the year under review scab (*Venturia inaequalis*) was particularly severe in Nova Scotian orchards where spraying was hindered by wet weather, the loss to the growers in the province being conservatively estimated at $750,000, though in parts of the Annapolis valley, where the trees were timely and regularly sprayed, the disease was kept under economic control. Leaves collected early in March revealed minute perithecia in an apparently pycnosclerotial stage formed mostly on the surface of the leaf uppermost on the ground. The first signs of ascus formation were observed towards the middle of April, and the first mature ascospores were found on 11th May. Leaves collected in the middle of April and placed in moist chambers in the laboratory began discharging ascospores in twelve days and continued for about twenty-five days. Collections made early in May started discharging in four days, and continued for twenty-four or twenty days, and similar results may be expected under field conditions. At the time of the initial discharge of ascospores the leaves of the Gravenstein variety were about ½ inch in width and had just passed the 'mouse-ear' stage. The first heavy discharge, at the end of May, found the trees past the 'pink tip' stage and starting to bloom. By the time of the next heavy discharge the petals had practically all fallen, and the fruit on some varieties was ¼ inch in diameter; subsequent heavy discharges took place when the fruit was rapidly growing and highly susceptible. Laboratory experiments showed that dipping leaves bearing numerous perithecia into a 1 to 50 solution of lime-sulphur reduced the period over which they discharged ascospores to an average of six days, and considerably reduced the germinability of the spores. Further experiments indicated that

twig lesions which mature in the autumn and remain exposed over winter are not as liable to cause initial infections in the spring as those which mature in the spring after growth has started. In severe cases infected twigs are killed outright, but when moderately or lightly infected the twigs apparently recover and the lesions assume a scurf-like appearance the following year. In no case were viable conidia obtained from two-year-old lesions. Twig infections were found to take place only on the current season's growth, and it is considered that thorough applications of spray or dust in the usual routine should give sufficient control. Counts made at the beginning of June to determine the percentage of infection on leaves within three feet and eight feet or more from the ground, respectively, gave the averages of 17·84 and 5·12, indicating that the lower branches should receive special attention for the first two or three treatments. In control experiments, lime-sulphur and Bordeaux mixture gave better results than sulphur dust or dehydrated copper sulphate dust.

Experiments to ascertain the factors that contribute to spray injury showed that spotting and marginal burning followed treatment with hydrated lime and with Bordeaux mixture when the twigs were kept in moist chambers after spraying, but when kept in the open no injury occurred except on leaves which took over half an hour to dry. Calcium carbonate sprays caused no injury, but twigs sprayed with distilled water and placed in moist chambers developed, after twenty-four hours, a light flecking burn which is attributed to potash leaching. Histological examination of the tissues injured by the sprays showed in practically every case the presence of one or more of the following conditions: varying stages of infection with scab; insect or mechanical injury; parasitic leaf spotting organisms; copper in the leaf tissue.

From a survey made in 1925 it would appear that the common apple rust in Nova Scotia is *Gymnosporangium germinale* and not *G. juniperi-virginianae* as had been previously reported.

Trials of pure line selections of varieties of turnips for resistance to club-root (*Plasmodiophora brassicae*) showed that Bangholm (Herning Str.) was the most resistant, giving 15 per cent. severely infected.

A severe outbreak of cucumber scab (*Cladosporium cucumerinum*) in greenhouses was partially controlled by the application of 4–6–40 Bordeaux mixture, sulphur dust (which caused considerable injury) or copper dust (12–88). The English forcing varieties of cucumber were found very susceptible in comparison with the common white-spined varieties.

RACICOT (H. N.). **Report of the Dominion Field Laboratory of Plant Pathology, Ste Anne de la Pocatière, Que.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 51–55, 2 figs., 1926.

Late blight (*Phytophthora infestans*) of potatoes was practically absent in 1925 from the plots of the Field Laboratory at Ste Anne de la Pocatière, Quebec, but spraying with Bordeaux mixture resulted in an increase of 10 to 15 per cent. both in total yield and in the yield of marketable tubers. In an experiment at Rivière Blanche,

Matana county, a plot planted with mosaic-diseased seed potatoes showed a decrease of 24·8 per cent. in the total crop and of 50·9 per cent. in the yield of marketable tubers in comparison with a plot planted with healthy seed. The decrease in yield was due more to the reduction in the size than in the number of the tubers, which indicates that the use of small tubers is a very important factor in the increase of mosaic.

Observations on the transmission of bean mosaic showed that plants which are infected with mosaic in the field do not exhibit mosaic symptoms until the following year. The germination of mosaic-diseased seed did not appear to be impaired, but the healthy plants yielded 20 bushels per acre against 15 bushels for the mosaic plants.

ALTSON (R. A.). **Appendix III. Report of the Assistant Botanist and Mycologist.**—*Rept. Dept. of Sci. and Agric. Brit. Guiana for the year ended 31st December, 1925*, 9 pp., 1926.

The following are the chief items of interest included in this report.

Further observations are recorded on the etiology of root disease of sugar-cane [*R.A.M.*, v, p. 345]. The disease is normally confined to a few stools in a field, but early in the year a severe epidemic broke out more or less simultaneously in several estates in Demerara and Berbice. The fact that a healthy crop almost invariably follows in a field severely affected by this disease in the preceding year, indicates that environmental conditions in regard to the actual incidence of the disease may have a greater influence than facultative parasites. Diseased plants show a progressive withering starting from the oldest leaves. The drying of each leaf proceeds from the margins inwards and there is seldom any yellowing. The root system is scanty and may be rotted. The production of a red hyaline substance in the vascular bundles at the base of the stem almost always accompanies the death of the tissues. It is considered probable that some toxin is concerned rather than mechanical injury, and that this is either secreted in the host tissue by a parasitic organism, or absorbed from the soil by the roots. Negative results have so far been obtained in the attempts to isolate a causal organism of the disease. *Melanconium sacchari* which develops on the dying canes appears to occur only as a secondary phase of the disease in question. *Trichoderma lignorum*, *Fusarium* sp. and *Gliocladium* sp. were isolated from plants showing early symptoms of the disease, where they were found closely adhering to the rootlets but not actually penetrating the cortical tissues. The first two organisms mentioned are common soil saprophytes and the third is probably of the same nature, but it is difficult to define the significance of their apparent close association with the cane roots.

The severity and extent of the damage caused by root disease appears to vary with the character of the soil. Analysis showed that whilst the amount of available lime present in the soil of affected fields was largely in excess of the available magnesia, the latter was found to occur in toxic quantities in the soil sifted from the roots of diseased canes. Further analyses of the ash of juice of

affected plants showed that large proportions of magnesia had accumulated in the stems. The available lime content of the soil near the roots was of the same order as in other parts of the field, and the author suggests that the toxic lime-magnesia ratio is not brought about by an exhaustion of lime consequent on the heavy demands of a growing crop, but rather by an increase in the quantity of available magnesia.

Scattered cases of rice blast [*Piricularia oryzae*] were observed, but there was no recurrence of the previous year's epidemic.

Plantains [*Musa paradisiaca*] continue to be affected by a disease resembling the 'moko disease' [*Bacterium solanacearum*: *R.A.M.*, v, p. 678]. The general appearance in the vascular tracts is very similar to that found in cases of Panama disease [*Fusarium cubense*] in the 'Gros Michel' banana. Three bacterial forms were isolated from bulbs and leaf bases displaying vascular discoloration, and are under study.

The so-called bud rot responsible for the dying out of coco-nuts in certain localities in British Guiana is distinguished from the true bud rot caused by a species of *Phytophthora* by the fact that the bud as a rule is the last portion of the crown to become infected. The name wilt is adopted for this disease.

The fungus isolated from the wilt disease of Liberian coffee occurring in the Pomeroon district has been inoculated into healthy roots with positive results. The cortical tissues were destroyed, and hollow spherical bodies, which were also obtained in pure culture and are supposed to be immature perithecia, developed in abundance. The fungus has been provisionally identified as a species of *Papulospora*.

NATTRASS (R. M.). **Report on advisory work, 1924–25. Economic mycology.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1925*, pp. 142–148, 1926.

Of the items included in this report, which refers to diseases occurring in the Bristol advisory province, the following are of special interest.

Ripe perithecia of pear scab (*Venturia pirina*) were recorded on leaves that had overwintered in grass orchards. Bacterial shot hole disease of plums and cherries, recorded for the first time in 1924, has now become general. Die-back of apples and stone fruits (*Diaporthe perniciosa*) continues to cause much anxiety among the growers, and it is suggested that the serious outbreak of the disease is the result of the wet season of 1924.

Several cases were reported of a disease of raspberry, in which the buds fail to break in the spring, the fruit does not set, or the shoots die back from the tip. Fructifications of *Hendersonia rubi*, *Coniothyrium fuckelii*, and *Didymella applanata* were found on diseased plants but are not thought to be the cause of the trouble. Isolations also yielded *D. perniciosa* with great frequency. On examination, the crowns of diseased plants were found to be invaded by fungi causing a definite crown rot. *Nectria rubi* occurred on such plants from two localities, and its pathogenicity as well as that of *D. perniciosa* is now under investigation.

SMOLÁK (J.). **Služba informační.** [Information service.]—*Druhá výroční zpráva stan. pro choroby rostlin na Mělníce za rok 1925–6* [*Second Ann. Rept. Phytopath. Stat., Mělnik, for the year 1925–6*], pp. 90–95, 4 figs., 1926.

Among the notes on plant diseases observed during the year under review at the Phytopathological Station of Mělnik [Czecho-Slovakia], the following are of special interest [see also *R.A.M.*, v, p. 146].

In some of the older vineyards of the Mělnik district a disease was recorded which the author considers to be a mosaic of the vine. In the early stages of the affection, the leaves show yellowish, indistinctly delimited spots of irregular shape, giving them a mottled aspect; later these spots increase in size and become whitish. The affected stocks do not thrive, the poorly developed shoots lean towards the main axis, and put forth stunted and entirely white leaves. This extreme stage is usually reached in the third year of infection. The disease differs from physiological chlorosis in that the leaf veins are the first to assume a yellowish discoloration, while in the former the veins remain green while the parenchyma is yellow. No organism has yet been found in the diseased tissues, nor is the mode of transmission known.

Other diseases reported to the Station included: scab (*Fusicladium dendriticum*) [*Venturia inaequalis*], on apple; *Polystigma rubrum* on plum; mosaic of mirabelle [*Prunus*]; *Plasmopara* [*Pseudoperonospora*] *cubensis*, *Botrytis*, and *Corynespora* [*melonis*] on cucumber; *Mycosphaerella fragariae* on strawberry; *Actinonema* [*Diplocarpon*] *rosae* on roses; *Septoria apii* on celery; *Pseudomonas campestris* on the cauliflower; *Lophodermium pini*, *Cronartium asclepiadeum* and *Armillaria mellea* on pines and firs: yellow rust [*Puccinia glumarum*] on wheat; snow mould [*Calonectria graminicola*] on rye; *Phoma betae* and *Rhizoctonia violacea* [*R. crocorum*] on beet, and in one case hop mildew [*Pseudoperonospora humuli*; *R.A.M.*, v, p. 185].

Division of Botany.—*Forty-fifth Ann. Rept. New York (Geneva) Agric. Exper. Stat. for the fiscal year ended June 30th, 1926*, pp. 27–31, 1927.

This report contains the following references of phytopathological interest other than those already noticed in this *Review*.

During 1925, investigations on the diseases of canning crops showed that the *Ascochyta* blight of peas [*A. pisi*] caused the most serious loss to the industry. Anthracnose [*Colletotrichum lindemuthianum*] and bacterial blight [*Bacterium phaseoli*] of beans, and leaf spot of tomatoes caused by *Septoria* [*lycopersici*] were also frequent. It was found that bacterial blight of beans could be greatly reduced by late planting, whilst the addition of 200 to 300 lb. of acid phosphate or 300 lb. of a 4–8–2 fertilizer per acre also helped the plants to escape the blight.

Evidence has been obtained that the maturation of the scab fungus [*Venturia inaequalis*] in the fallen apple leaves is as dependent on moisture supply as on temperature. Late summer applications of Bordeaux mixture and lime sulphur solution in 1925 caused no appreciable spray injury and reduced the percentage of

fruit affected with scab. During the year, Bordeaux-oil-lime-sulphur, dry mix sulphur-lime, and one form of colloidal sulphur applied during the pink period gave equally good control of scab [*R.A.M.*, v, p. 614; vi, p. 36]. A new fungicide zinc sulphide, 5 lb. to 100 galls. of water, gave no indication of causing injury.

Tests on seed treatment for the control of blackleg of Crucifers [*Phoma lingam*: *R.A.M.*, v, pp. 270, 400] showed that the best results are given by the hot water treatments. Attacks of black rot of cauliflower [*Pseudomonas campestris*] have been found to arise from infection carried in the seed of other cruciferous plants in the same seed bed as well as from infected cauliflower seed. Treatment of the seed by the hot water method together with care in locating the seed bed will, it is thought, greatly reduce the loss from this disease.

Inoculation experiments show that mustard, rutabaga [*Brassica campestris*], flat turnip and Chinese cabbage [*B. pekinensis*] are very susceptible to mosaic, but rape is much less so.

Preliminary tests of two dust preparations, both organic compounds of mercury, on seed potatoes, as substitutes for the corrosive sublimate treatment [against *Rhizoctonia solani*] have given promising results.

MARTIN (G. H.). **Diseases of forest and shade trees, ornamental and miscellaneous plants in the United States in 1925.**—*Plant Disease Reporter, Supplement* 50, pp. 413–478, 1 map, 1926. [Mimeographed.]

Among the many interesting references included in this report, which follows the same lines as those of earlier years [*R.A.M.*, v, p. 80], the following may be mentioned:

Cedar blight (*Phomopsis juniperovora*), an account of which is given by G. H. Hahn, was much less destructive in conifer seed-beds than in the previous year, owing to the particularly dry season. The distribution of the blight has extended to California, Connecticut and Washington. Some thirty-five coniferous species representing fourteen genera are known to be affected, including species of *Sequoia*, *Tsuga*, *Abies*, *Larix* and *Thujopsis* reported in 1925 for forms regarded as strains of the fungus.

In the section on white pine (*Pinus strobus*) blister rust (*Cronartium ribicola*), prepared by J. F. Martin, it is noted that the southward spread of the disease into northern New Jersey and north-eastern Pennsylvania has been comparatively slow, but in the Lake States the progress has been somewhat more rapid, although the scattered occurrence of the white pine over large areas has hindered the spread to a certain extent. In Minnesota many new cases have been reported. Conditions were recorded as unfavourable for the spread of rust in the west, and the extension of the known distribution was negligible.

Chestnut blight (*Endothia parasitica*) is reported by G. F. Gravatt and R. P. Marshall to have increased in severity in the southern Appalachians during 1925 and appears to be spreading rapidly throughout the chestnut growing areas in Ohio. Certain exotic chestnuts were observed to be quite resistant while native

trees varied in their susceptibility, though none were exceptionally resistant.

Amongst the pine diseases *Cronartium strobilinum* was of widespread occurrence in Florida, attacking the long leaf pine (*Pinus palustris*) and the slash pine (*P. caribaea*) and is said to be an extremely important factor in the reproduction of the host.

Uncinula macrospora was very common on *Ulmus alata* in Florida, *Gnomonia ulmea* on *U. americana* in Michigan and Missouri, and *Sphaeropsis ulmicola* on elms in nurseries in Wisconsin.

Leaf scald of maple (*Acer* sp.) and a large variety of other plants was prevalent in New York, Delaware and Michigan, probably due to the hot drying winds of June and July followed by a prolonged drought.

Gnomonia veneta was severe on oaks in certain localities of New Jersey and on plane (*Platanus occidentalis*) in Iowa, Utah and Washington.

A bacterial leaf blotch of *Tilia americana* was widely spread in New York State, the disease causing large black blotches on the leaves, which defoliated prematurely.

Fomes igniarius was reported attacking 80 or 90 per cent. of poplar trees (*Populus*) in certain areas of Minnesota causing severe damage.

Of the diseases of ornamental plants, *Fusarium conglutinans callistephi* caused a considerable loss to growers of the china aster (*Callistephus chinensis*) in New York, and a somewhat distinctive species of *Fusarium* was isolated from the wilted plants. A stem rot of carnation (*Dianthus caryophyllus*) caused by *Corticium vagum* [*C. solani*] was prevalent in Oregon, and a few cases were recorded in New York and Kansas. A wilt of chrysanthemums caused by a species of *Verticillium* was of considerable importance in Michigan.

A bacterial disease of a species of *Cotoneaster*, similar to fireblight of apples [*Bacillus amylovorus*], was reported in Minnesota for the first time, causing important damage. A condition known as 'stunt', resembling a mosaic disease, was found on dahlia leaves in Delaware and Maryland. It is characterized by the peculiar yellowish-green shade of the plants, the reduced size of the leaves, and the absence or poor condition of the flowers. The disease does not appear to spread rapidly, but infected plants die off usually during the winter. The transmission of the disease by certain insects is suspected.

Bacterial blight (*Bacterium gummisudans*) of gladiolus was widespread in Michigan, and reported also in Ohio and Minnesota. Leaf spot (*Septoria gladioli*) was very common in New York.

Yellows of pansy (*Viola tricolor*), thought to be a disease of the mosaic type, was observed attacking thousands of plants in one locality in Columbia. The plants were dwarfed, and the flowers small and inferior.

Leptosphaeria coniothyrium causing cane blight of the rose was reported from several States, and was severe in New Jersey. A blossom blight of the rose, probably due to physiological causes, occurred in Kansas. It was characterized by the outer petals being brown and dry and the stem for $\frac{1}{4}$ to $\frac{1}{2}$ inch below the bud dry and shrivelled.

Tulips (*Tulipa gesneriana*) were attacked by *Botrytis tulipae*, especially the Darwin and Cottage varieties, in a number of States, and appeared for the first time in Oregon, where it caused considerable damage. A case is recorded of flowers picked in the rain being covered with spots when they reached their destination.

A leaf spot (*Cercospora violae*) was prevalent in violet (*Viola* sp.) nurseries and beds in Georgia, especially where watered artificially. This disease is generally distributed in Florida but is not serious.

CARNE (W. M.). **Earcockle (Tylenchus tritici) and a bacterial disease (Pseudomonas tritici) of Wheat.**—*Journ. Dept. Agric. Western Australia*, Ser. 2, iii, 4, pp. 508–512, 3 figs., 1926.

After a detailed description of earcockle of wheat and rye, caused by *Tylenchus tritici*, and its control, the author states that the bacterial disease associated with it was first recorded in Australia in 1923 and again in 1925, when it was identified with that described by Hutchinson in India in 1917, as *Pseudomonas tritici* [*R.A.M.*, iv, p. 470].

The disease is characterized by the development of a bright yellow slime on the abortive ears and on the leaves in contact with them, and the total failure of affected plants to form grain. The evidence available indicates that the bacteria are unable to attack the plants directly, and the control of the disease is therefore identical with that for earcockle, i.e. sowing only clean seed and growing an immune crop such as oats, barley or peas the year following an attack, as one year without wheat or rye ensures the death of eelworms in the soil.

Field experiments at the Merredin Experiment Farm in 1926 showed that both cockle and the bacterial disease are readily spread by water lying on the ground after heavy rain.

STRAŇÁK (F.). **Suchá mořidla — mořidla budoucnosti.** [Dusting is the seed disinfection treatment of the future.]—*Ochrana Rostlin*, vi, 1–2, pp. 1–5, 3 figs., 1926.

In the present brief note the advantages are pointed out of the disinfection of cereal seed with dusts over steeping processes for the control of smut diseases, and the claim is made that in time the latter will be entirely superseded owing to their cumbersomeness and difficulty of application. Preliminary tests made with copper carbonate in Czecho-Slovakia proved rather disappointing, but good results were obtained with a number of well-known commercial dusts, including porzol (Society for the Chemical and Foundry Industry in Ustí [Aussig]), tutan (Saccharin-Werke A.-G., Magdeburg), and cuprobol (Heyden A.-G. chemical works in Radebeul-Dresden). The figures illustrate an apparatus, named 'Rotar', for dusting the seed, which is constructed by Josef Klement (Hrobcí on the Elbe), on the specifications of the author.

STAUCH (F.). **Ein Mittel gegen den Getreiderost.** [A means for the control of cereal rust.]—*Illus. Landw. Zeit.*, xlvi, 41, p. 520, 1926.

The author refers to a communication from a German grower

who claims to have obtained good results in 1926 in the control of cereal rusts [*Puccinia* spp.] by top dressings of common salt in early spring at the rate of 4 to 6 cwt. per hectare. Potassium fertilizers appeared to increase the resistance to rust, and the author suggests that applications of kainit might be a valuable means for controlling the rusts, as this substance contains both sodium and potassium chlorides.

SANFORD (G. B.). **Report of the Dominion Field Laboratory of Plant Pathology, Saskatoon, in co-operation with the University of Saskatchewan.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 95–101, 3 figs, 1926.

An intensive survey has been made to determine the spread of the take-all disease of cereals (*Ophiobolus cariceti*) in Canada, where it was first reported in 1923 [*R.A.M.*, iii, p. 714]. The results indicate that it is located mainly in the semi-wooded or scrub districts chiefly to the north of the prairie lands between the latitudes 52° and 53°; it was also found in the Clover Bar district, Alberta, and in Manitoba. The varieties of wheat found to be susceptible were Einkorn, Emmer, Spelt, Polish, Alaska, Acme, Kubanka, Little Club, Marquis, Kitchener, and Ruby; barley and rye were slightly susceptible, and oats not noticeably so. Grasses were infected to varying degrees. The injury to wheat varied from slight to 20 per cent. loss, and appeared to be more severe on the second crop than the first, while serious damage appeared on the third and successive crops. Very little disease was observed on wheat following summer fallow.

In south eastern and eastern Saskatchewan heavy losses were caused by stem rust of wheat (*Puccinia graminis tritici*), while in the northern parts injury only occurred to any marked extent on the latest wheat.

WEBB (R. W.) & FELLOWS (H.). **The growth of Ophiobolus graminis Sacc. in relation to hydrogen-ion concentration.**—*Journ. Agric. Res.*, xxxiii, 9, pp. 845–872, 8 graphs, 1926.

In these investigations on the influence of hydrogen-ion concentration on the growth of *Ophiobolus graminis*, the authors used a single spore strain of the fungus, originally isolated from a diseased wheat plant growing in New York State.

The results indicate that the organism is apparently capable of growth throughout a wide range of hydrogen-ion concentration both in solid and liquid media. The P_H range and P_H optimum varied considerably, depending to a large extent upon the physical and chemical nature of the medium and environmental factors [*R.A.M.*, v, pp. 353, 354]. In general, the growth rate within favourable P_H ranges (3·2 to 9·6) was more or less uniform for the various solid media employed. On the corresponding liquid media the best growth occurred consistently in potato dextrose decoction. Progressive and reversible shifts in the reaction of the media were induced by the growth of the fungus and these varied with the duration of the growth interval, the initial reaction, and the nature of the media. Temperature and length of the period of growth

both influenced the optimum reaction for fungous growth in potato dextrose decoction, but did not materially alter the P_H range through which growth occurred. The optimum temperature for growth on potato-dextrose decoction was 24° C., followed in order by 20°, 16°, 28°. This optimum was not altered by variations in the hydrogen-ion concentration. Light was found to have little influence on growth.

Although the hydrogen-ion generally proved to be more toxic to the growth of the fungus than the hydroxyl ion, the toxicity of each was variable, depending on the medium. In view of the diverse results obtained by the writers in these experiments it is thought probable that variations in soil type and fertility would be found to modify the influence of soil reactions on the growth of the fungus and the occurrence of the disease in the field. It would appear, therefore, that the control of take-all disease by the mere adjustment of soil reaction can only be expected to give uncertain results.

GREVE. **Erfahrungen über den diesjährigen Rostbefall beim Winterweizen und einige Vorbeugungsmassnahmen.** [Experience derived from this year's outbreak of rust of winter Wheat, and some prophylactic measures.]—*Illus. Landw. Zeit.*, xlvi, 44, pp. 551–552, 1926.

The present report gives a summary of the results obtained from an investigation, made in 1926 by the Board of Agriculture in Cassel and the Hessian Saatbauverein, of the causes of the widespread epidemic of rust [*Puccinia* spp.] in that year, which is stated to have been responsible in Germany for considerable losses to cereal crops, and more particularly to winter wheats. One of the principal factors is considered to have been the weather, which remained cold and wet throughout the whole spring, thus retarding the growth of the plants and rendering them highly susceptible to the disease. A brief sunny and warm interval during the first days of July was followed by renewed rains, which gave a fresh impetus to infection. It was noted that fields which had received excessive nitrogenous fertilization exhibited earlier and heavier attack, while those manured with sodium and potassium fertilizers were comparatively more resistant. Wheat following leguminous crops or rape appeared to be more rusted than when it followed beet, potatoes and other roots. Tillage also appeared to have a bearing on the incidence and severity of rust, neglected fields showing a considerable degree of attack. On the ground of these findings, appropriate recommendations are made for the prevention of further outbreaks of rust, including the use of rust-resistant varieties [a brief list of which is given] and the avoidance of low-lying and enclosed areas for sowing cereal crops.

LEIDNER (R.). **Beitrag zur Rostfrage des Weizens, sowie dessen Anbau auf leichteren Böden.** [Contribution to the Wheat rust question, and the cultivation of Wheat on lighter soils.]—*Illus. Landw. Zeit.*, xlvi, 38, pp. 477–478, 1 fig., 1926.

Cereal crops in Germany, and more particularly wheat, are stated to have suffered heavily from rusts [*Puccinia* spp.] in 1926, owing

to the wet weather conditions of that year. The author stresses the necessity of controlling the disease by the breeding of resistant varieties and states that the wheat Rimpau, in his experience, gave the best results in 1926, both from the point of view of resistance to rust and also of yield of grain.

GÜSSOW (H. T.). **Report of the Dominion Botanist.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 5–6, 1926.

In prefacing the extensive report of the Division of Botany for the year 1925, the author briefly describes the work done and the progress attained in Canada in crop diseases investigations. In pursuance of the researches in connexion with cereal rusts [*Puccinia* spp.], uniform rust nurseries of wheat and oats were established at a number of experimental farms and stations in eastern Canada, in co-operation with the United States Department of Agriculture, for the purpose of locating the distribution of prevalent biological strains of rusts in that section of Canada. The results obtained at the different Canadian nurseries are shown in two appended tables.

CONNERS (I. L.) **Smut investigations.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 85–93, 1926.

Extensive experiments were carried out at the Dominion Rust Research Laboratory, Winnipeg, in collaboration with the experimental farms at Brandon, Manitoba; Indian Head, Rosthern, and Scott, Saskatchewan; and Lacombe, Alberta, to test the comparative value of seed treatment with formalin and with copper carbonate in the control of bunt of wheat (*Tilletia tritici*). The results showed that copper carbonate dust at the rate of 2 or 3 oz. per bushel successfully controlled bunt under average conditions of seed contamination. It had no depressing effect either on the germinability of the seed or on the yield, while formalin reduced the germination and the vigour of the stand.

In experiments to test the efficacy of copper carbonate dust (4 oz. per bushel), sulphur (6 oz. per bushel), and semesan (0·3 per cent. solution) in the control of covered smut (*Ustilago levis*) of hull-less oats, the best results were obtained with the two first-named preparations, the percentage of infection in the resulting stands being reduced from 79·4 to 5·6 and 3·8, respectively.

Tests with uspulun and germisan at the concentration of 0·25 per cent. and semesan at 0·3 per cent. for the control of loose smut of wheat (*U. tritici*), loose smut (*U. nuda*) and stripe disease (*Helminthosporium gramineum*) of barley, showed that all three compounds were but slightly effective at room temperature, though somewhat more effective at a temperature of 45° C. against the loose smuts, while the stripe disease appeared to be effectively controlled by them. The modified hot water treatment eliminated the loose smuts, but failed to control the stripe disease.

An extensive experiment was started in 1925 to test the varietal resistance of oats to covered smut. The one variety of *Avena brevis* tested was immune. Nearly all the varieties of *A. byzantina*

proved either immune or highly resistant. The varieties Laurel and Liberty of *A. nuda* showed 34·9 and 62 per cent. infection, respectively. Ninety-four varieties of *A. sativa* varied from complete resistance to high susceptibility, and practically all the varieties tested of *A. sativa orientalis* were highly susceptible.

PLAUT (M.). **Beiz- und Stimulationsversuche mit Zuckerrübensamen und Getreide.** [Experiments on disinfection and stimulation of Sugar Beet and cereal seeds.]—*Zeitschr. für Pflanzenkrankh. u Pflanzenschutz*, xxxvi, 11–12, pp. 321–351, 9 figs., 1926.

Carefully conducted experiments of recent years in Europe have shown no increases of crop due to growth stimulation, resulting from the treatment of cereal and other seeds with inorganic and organic chemicals. The writer's tabulated records show the effects of steeping seed of winter and spring wheat, winter barley, and oats, in various fertilizer salts and disinfectants, for the control of bunt [*Tilletia tritici* and *T. levis*], stripe disease [*Helminthosporium gramineum*], and loose smut of oats [*Ustilago avenae*], respectively. Immersion of seed wheat in 5 per cent. superphosphate for 30 minutes fully controlled bunt of wheat, but treatment with dilute solutions of fertilizer salts (0·1 to 0·2 per cent. for 1 hour) had no effect on the control of stripe disease of barley. Among the compounds containing arsenic which were tested, only arsenite of soda and aminophenyl arsenious oxide fully controlled stripe of barley and bunt of wheat (in each case 0·2 per cent. for one hour at 18° C.). Trials with the newer disinfectants indicated that germisan, tillantin (678), agfa, and uspulun (in each case 0·25 per cent. for 1 hour at 18°) controlled stripe of barley and bunt of wheat, and that the first three were effective also against loose smut of oats; at a temperature of 40° to 42° concentrations of 0·075 per cent. for 25 minutes gave equally adequate control. Of the seed disinfectant dusts recently introduced, Höchst 692, 614, and 714 controlled stripe of barley and bunt of wheat, while (agfa) B IV 62, S II 33, and S. II 32 were effective against loose smut of oats, but failed to control stripe and bunt; these dusts are highly poisonous and their general employment is problematical. The treatment of beet seed with disinfectants, including gaseous formaldehyde for the control of root rot, cannot be recommended.

PEYRONEL (B.). **La sterilizzazione del terreno e la flora radicicola normale del Frumento.** [Soil sterilization and the normal flora of the roots of Wheat.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 348–358, 2 figs., 1926.

In connexion with his investigations on the fungous symbionts of the roots of phanerogams [*R.A.M.*, iii, p. 538], the author presents the results of a series of pot experiments conducted since 1922 on the effect of soil sterilization on the yield of untreated seeds of clover, lucerne and wheat.

Partial sterilization of the soil with formalin, carbon bisulphide or sulphuric ether caused an increase in yield of wheat of 129, 139, and 145 per cent. respectively, whilst complete sterilization in the autoclave resulted in an increase of 219 per cent. compared

with the control. An examination of the root system of the plants used in the experiments in order to determine the amount of fungous infection showed 10·25 per cent. infection after complete sterilization of the soil; 16·3 per cent. after formalin treatment; 19·0 per cent. after carbon disulphide; and 14·9 per cent. after ether, as compared with 96·45 per cent. from the control. These results indicate that, in the main, root infection is in inverse ratio to the yield, though other factors such as the physical and chemical properties of the soil evidently exert an influence also.

In the roots of the control plants examined, the phycomycetoid endophyte was the most freely developed, followed in order by *Rhizoctonia*, *Asterocystis radicis*, a *Pythium* (less frequent) and one or more species of *Fusarium* (especially evident at the base of the root or culm). In soil treated with antiseptics, the endophytic mycorrhiza was rarely more noticeable than the *Rhizoctonia* and *Asterocystis*. Only the surface roots appeared to be infected; the deep roots remained practically free from attack, even after seven months' exposure of the pots in the open.

ROHWEDER (M.). **Heisswasserbeize im Grossen, verbunden mit chemischer Beizung bei Benützung einer Brennerei-Anlage.** [Combined wholesale hot water and chemical cereal seed disinfection, using a distillery plant.]—*Deutsche landw. Presse*, liii, 40, pp. 507–508, 1926.

A detailed description is given of a method devised by the author for subjecting large parcels (25 to 30 cwt.) of cereal seed to a combined hot water and chemical disinfection, which is stated to have given perfect control of stripe disease of barley [*Helminthosporium gramineum*], loose smut [*Ustilago tritici*], and bunt [*Tilletia tritici*] of wheat. Care should be taken that the temperature of the water never exceeds 48° C. The best results were obtained with 0·5 to 0·75 kg. germisan, 1 kg. uspulun, or 1·25 kg. agfa-beize per vat of 3,000 l. capacity, while Hohenheimer-beize, tillantin B and C, and segetan were both less effective and impaired the germinability of the seed.

RODENHISER (H. A.). **Physiological specialization of Ustilago nuda and Ustilago tritici.**—*Phytopath.*, xvi, 12, pp. 1001–1007, 1 fig., 1926.

The author, in the present paper, gives a detailed account of the cultural characteristics of six distinct forms of *Ustilago nuda* and three of *U. tritici*, all from widely different sources, as a preliminary to the investigation of the possible existence of physiologic strains in these fungi. No morphological differences were found between the two species, and the writer considers that they are but physiologic forms of one fungus [*R.A.M.*, iv, p. 248], conveniently considered as two species according to their host plants, and each 'species' itself consisting of several biologic strains.

NOVÁK (S.). **O pruhovitosti Ječmene.** [Stripe disease of Barley.] —*Ochrana Rostlin*, vi, 3, pp. 33–36, 1 fig., 1926.

A very brief account is given of the stripe disease (*Helminthosporium gramineum*) of barley, which is stated to be of consider-

able economic importance in Czecho-Slovakia. Of the recommendations made for the control of this disease, the most important is the treatment of the seed with mercury preparations, among which germisan, kalimat and uspulun gave satisfactory results under experimental conditions.

NOVÁK (S.). **Několik poznámek o pruhovitosti Ječmene.** [Some notes on the stripe disease of Barley.]—*Ochrana Rostlin*, vi, 4, pp. 83–85, 1926.

In giving a brief, popular description of the stripe disease (*Helminthosporium gramineum*) of barley, special attention is directed to the fact that in affected fields, besides ears entirely destroyed by the disease, others are found which develop normally, but some of the grains bear more or less extensive dark brown spots on their cuticle. In order to test whether such spotted grains carry the disease, 300 from a number of sources were sown in 1925 in a greenhouse to prevent outside contamination. All the seeds germinated and gave rise to healthy plants, with the exception of one, the lower leaves of which exhibited some suspicious spots. Microscopical examination of grains of the same sample showed the presence in the cuticle, under the spots, of small accumulations of an undetermined mycelium. In the author's opinion, however, the spotting was not caused by *H. gramineum*, but was due to physiological causes, of which sun scorch is considered to be the principal. No difference was noticed in the germinability of the spotted grains as compared with that of normal grains.

DIETZ (S. M.). **The alternate hosts of crown rust, Puccinia coronata Corda.**—*Journ. Agric. Res.*, xxxiii, 10, pp. 953–970, 4 figs., 1926.

The author records the results of his further investigations on the aecidial hosts of the crown rust (*Puccinia coronata*) [*P. lolii*: *R.A.M.*, ii, p. 209; iii, p. 203]. Inoculation experiments showed that teleutospores of the fungus on *Avena sativa* could infect *Rhamnus alnifolia*, *R. californica*, *R. californica* var. *tomentella*, *R. caroliniana*, *R. cathartica*, *R. crocea*, *R. dahurica*, *R. ilicifolia*, *R. lanceolata*, *R. pachyphylla*, *R. pinetorum*, *R. rubra*, *R. smithii*, and *R. tinctoria*, whilst *R. frangula*, *R. nevadensis*, and *R. purshiana* showed a marked resistance to this form. Similarly the form on *Calamagrostis canadensis* could infect *R. alnifolia*, *R. californica*, *R. californica* var. *tomentella*, *R. cathartica*, *R. crocea*, *R. lanceolata*, *R. pinetorum*, *R. rubra* and *R. smithii*, whilst the other eight species of *Rhamnus* were resistant. For the physiological form from *Festuca elatior*, *R. alnifolia*, *R. californica*, *R. californica* var. *tomentella*, *R. caroliniana*, *R. cathartica*, *R. crocea*, *R. lanceolata*, *R. rubra* and *R. smithii* were found to be possible alternate hosts, while the remaining seven were more or less resistant. Teleutospores from *Notholcus* [*Holcus*] *lanatus* produced pycnidia on *R. lanceolata*. *Berchemia scandens* was infected with teleutospores from *Avena sativa*, and *Lepargyrea canadensis* with those from *Calamagrostis purpurascens*.

These results clearly indicate that each physiologic form of the fungus has its alternate host range as well as its gramineous host

range. The fact that the fungus on *A. sativa*, after being grown on *Rhamnus* spp., could infect *H. lanatus*, whilst uredospores from *A. sativa* infect *H. lanatus* only occasionally, is considered by the author to indicate that *Rhamnus* species functioning as alternate hosts may alter the physiologic response of specialized forms.

Since *R. dahurica* is not immune from infection by teleutospores from *Avena sativa*, separation of *P. himalensis* and *P. coronifera* [loc. cit.] with *R. dahurica* as differential host cannot be maintained in America.

A rough computation of the amount of *R. cathartica* growing in the Upper Mississippi Valley was made and it has been ascertained in the field that *R. cathartica* and *R. lanceolata* have been instrumental in starting epidemics of crown rust in Iowa.

SIMMONDS (P. M.). **Report of the Dominion Laboratory of Plant Pathology, Indian Head, Saskatchewan.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 93–95, 1926.

In environmental studies at the University of Wisconsin on the root rot of oats caused by *Fusarium culmorum*, it was found that, within the range of 8° to 30° C., the lower soil temperatures encouraged root development, with a decrease in dry weight towards the higher temperatures, while the top growth was increased at the higher temperatures, the optimum lying between 21° and 27°, and falling off sharply beyond this range. With 20 and 35 per cent. soil moisture the optimum soil temperature for the development of the disease coincided fairly well with the optimum for the growth of *F. culmorum* on artificial media (24° to 28° C.), but with 50 per cent. soil moisture the optimum was reduced to about 18°, the limiting effect of the temperature apparently being offset by the increase in moisture. Preliminary tests to determine the value of certain seed-disinfectants in the control of this disease showed that uspulun gave by far the best results, while the formalin series showed more disease than the controls, and copper carbonate dust proved unsatisfactory.

Root rot of cereals (*Fusarium* spp. and *Helminthosporium sativum*) is stated to be very severe in some districts of southern Saskatchewan, and extensive work in connexion with this disease is now in progress.

HÜLSENBERG. **Liegt in diesem Jahre eine besondere Notwendigkeit vor, den Roggen einer Beizbehandlung zu unterziehen?** [Is there any particular necessity this year to subject Rye to seed disinfection treatment?]—*Deutsche landw. Presse*, liii, 40, p. 507, 1 fig., 1926.

The statement is made that in 1926, owing to the prevailing wet weather, rye suffered throughout Germany from heavy attacks of *Fusarium nivale* [*Calonectria graminicola*] and barley from attacks of *Fusarium* spp. Seed samples received from a number of sources have been found to be heavily infected, and the importance is therefore stressed of disinfecting all seed if an epidemic is to be avoided in 1927. A brief list of recommended fungicides for seed treatment is given.

CHRISTENSEN (J. J.) & STAKMAN (E. C.). **Physiologic specialization and mutation in Ustilago zeae.**—*Phytopath.*, xvi, 12, pp. 979–999, 11 figs., 1926.

The study reported in the present paper was undertaken to ascertain the number, characteristics, and geographic distribution of physiologic strains of *Ustilago zeae* [*R.A.M.*, v, pp. 486, 545] in the United States, and to inquire into their stability and pathogenicity. The fifteen strains studied were quite distinct in cultural characters; some differed more from one another than from certain forms of *U. tritici*, indicating that they are probably themselves only physiologic forms of this fungus. The pathogenic behaviour of the fifteen strains was tested by field inoculations on ten selfed lines of maize. Seven or possibly eight different forms were recognized in this way, and these varied in degree of pathogenicity from very virulent to almost innocuous. Resistant lines of maize were found to be completely susceptible to at least one physiologic form.

Mutants occurring in the cultures, on being sub-cultured during varying periods, were found to breed true. These differed from their parents in pathogenicity as well as in general appearance in culture media.

The occurrence of physiologic strains and mutants in the smuts renders the breeding of resistant varieties a very complex question. The methods of developing true resistant strains must be modified to include inoculation trials with all forms of the causal organism occurring in a region for which the varieties are intended.

DUFRÉNOY (J.). **Les champignons de la gommose des Citrus et de la pourriture des fruits.** [Fungi causing gummosis of Citrus trees and rot of the fruits.]—*Rev. de Bot. Appliquée*, vi, 64, pp. 747–754, 4 figs., 1926.

After a brief review of the recent work which has been carried out on the species of *Phytophthora* attacking citrus (*P. parasitica* and *P. citrophthora*) [*R.A.M.*, v, p. 549] and *Blepharospora cambivora* on the chestnut, the author describes the results of the investigations which have been made on the relation of these parasitic species of *Phytophthora* to the tissues parasitized.

The parasitic species of *Phytophthora* appear to be able to live only in young meristematic or cambial tissues. Hyphae of *Phytophthora* or *Blepharospora* advance in the cambium between the cortex and wood, and at a certain distance from the infected region, a cork layer is formed which isolates the cells on the side towards the fungus; these soon die and their contents become replaced by tannin vesicles. If the cork is developed rapidly, the advance of the parasite may be arrested and the wound commences to heal. Secondary moulds may invade the tissues killed and quickly supplant the parasite. This is especially true in the case of *Fusarium limonis*, which has frequently been seen to invade the tissues of citrus trees affected by *Phytophthora* causing gummosis in Corsica.

In discussing methods of control the author points out that it is necessary to avoid the contamination of the irrigation water by zoospores arising from rotted fruits which may have fallen from the trees [see also *R.A.M.*, v, p. 681].

PETRI (L.). **Clorosi maculata internervale delle foglie degli Agrumi.** [Intervenal mottling of the leaves of Citrus trees.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 380–384, 2 figs., 1926.

A partial chlorosis of citrus very similar to the mottle leaf recorded in America has been observed in Sicily in orchards badly attacked by *Colletotrichum gloeosporioides*. There appears to be, however, no connexion between the fungus and the disease, which is considered to be due to physiological causes. The determination of the reaction of the leaf tissues by the colorimetric method showed that an excess of acid accumulates in the chlorotic region as compared with the contiguous green area, and it is thought this remains unneutralized when there is a lack of available calcium in the soil. In America an inadequate supply of calcium in the soil is liable to bring about this condition, but in Sicily, in an area known to be deficient in calcium, only a few trees showed signs of mottling, and other possible factors may be involved. The hypothesis that the chlorotic condition is due to the application of alkaline salts is disproved by the fact that the soil reaction is almost always slightly acid in the Messina citrus groves, and it is more probable that excessive fertilization with ammonium sulphate may be a contributory factor.

ARCHIBALD (R. G.). **Sulfuric acid treatment of Cotton seed.**—*Soil Science*, xxiii, 1, pp. 1–3, 1927.

Experiments were carried out at Khartoum, Sudan, to test the effect of treating Egyptian Sackel cotton seed with sulphuric acid on germination and on the control of black arm [*Bacterium malvacearum*]. Seed treated in the proportion of 500 gm. to 100 c.c. concentrated acid for 1 hour, then washed in 2 l. of water for 10 minutes and either sown at once or dried and then sown, gave a germination of 95 per cent.; seed treated, dried, and stored for 6 months showed 92 per cent. germination. The treated seed gave better germination and better plant growth than untreated seed. Delinting with sulphuric acid did not fully free the seed from the black arm organism, but it delayed the appearance of the disease.

ARCHIBALD (R. G.). **Black arm disease of Cotton with special reference to the existence of the causal organism, B. malvacearum, within the seed.**—*Soil Science*, xxiii, 1, pp. 5–9, 1 pl., 1927.

In the course of studies on the black arm disease of cotton in the Sudan [see preceding abstract] the writer was unable to obtain *B*[*acterium*] *malvacearum* from the lint, fuzz, or from the coats of the seeds. Seeds from infected plants were heated to 70° C. for 1 hour in a hot-air oven and then planted in pots of sterilized soil (heated to 180°), which were watered daily with sterile water and protected from insects; the seeds germinated and the cotyledons showed heavy infection with the angular leaf spot symptoms of the disease, *Bact. malvacearum* being readily recovered from the lesions. This result seemed to indicate that the seed had been infected internally. In another experiment ginned seeds from plants attacked by black arm 12 months earlier were placed in

absolute alcohol for 3 minutes, the alcohol burnt off and the seeds dropped into sterile water and incubated at 31° to 33° for 48 hours to soften and split the seed-coats; the seeds were then crushed, incubated for a further 24 to 36 hours, and the fluid used for making cultures on agar slopes. By this means, *Bact. malvacearum*, the identity of which was established by cultural and inoculation tests, was obtained, in some instances, from 20 per cent. of seeds taken from infected plants. Seeds were also fixed, sectioned, and stained, and the bacteria detected in the resin canals and the tissues of cotyledons.

The writer records another experiment with diseased seedlings, the infected cotyledons being removed and the supporting stems examined for gross lesions. Stems free from lesions were soaked in absolute alcohol, ignited, crushed in sterile water, and agar cultures prepared; tissues of the main stem supporting infected bolls were treated also in the same way. From such apparently healthy areas *B. malvacearum* was obtained, indicating possible latency on the part of the organism, a view which was supported by observations in the field.

The other likely sources of infection, besides the seed, are soil, water, insects, and ginning factories. No evidence could be found incriminating soil and irrigation water, and no epidemiological evidence exists in the Sudan pointing to transmission by insects; infection trials with flea-beetles, thrips, aphis, stem borer, and white ants resulted negatively. The organism's feeble powers of resistance to sunlight, desiccation, and high temperature preclude the possibility of its survival in ginning factories.

BAL (D. V.). **Cotton wilt in Central Provinces and Berar.**—*Journ. Indian Bot. Soc.*, v, 3, pp. 117–120, 1926.

In this paper the author presents certain data in criticism of Dastur's theory [*R.A.M.*, iii, p. 720] that wilt disease of cotton in the Central Provinces, India (attributed by him in collaboration with Ajrekar to a species of *Fusarium*) [*F. vasinfectum*: ibid., i, p. 292], is primarily due to the accumulation of aluminium salts in the plant tissues [see also ibid., v, pp. 762, 767].

Samples of soils from normal and diseased areas were found to be quite alkaline, with P_H values of 8·0 to 8·6 and 8·4 to 8·8, respectively. Water extracts from such soils did not contain even traces of soluble aluminium, while determinations of active aluminium in the soils themselves showed the proportion to be very small. Pot culture experiments carried out in the Central Provinces many years ago proved that super [phosphate] did not reduce wilt disease, although if the latter were due to aluminium concentration the addition of superphosphate would be expected to check it. The author also draws attention to the lack of analytical data on the aluminium content of healthy and wilted plants and of information concerning the effect of water extracts from wilt-producing soils on the plant. Finally he points out that even if an excess of aluminium salts occurs in wilted plants, this may simply be due to the disturbance of the physiological processes caused by the fungus.

PELTIER (G. L.), KING (C. J.), & SAMSON (R. W.). **Ozonium root rot.**—*U.S. Dept. of Agric. Bull.* 1417, 25 pp., 11 pl., 1 diag., 1 graph, 1926.

In part one of this paper the first two authors describe the results of their study of the root rot caused by *Ozonium* [*Phytamatotrichum*] *omnivorum* [*R.A.M.*, iii, p. 134; iv, p. 636], which attacks primarily cotton, lucerne, and fruit trees in Texas, New Mexico, Arizona, and California. The disease, which is indigenous in these regions, has never been reported in acid soils.

A study of the root systems of cotton plants at various stages of infection, gave no evidence of spread by contact of diseased with healthy roots, but indicated that the fungus usually progresses radially from a central point, through the soil as in fairy rings. Plants in the line of the advancing mycelium are subject to attack, generally on the tap root within the first foot of soil, in which case they show a pronounced constriction just below the collar. The lateral roots usually rot from the point of attachment with the tap root.

The penetration of the roots is effected by the strand hyphae (comparable to some extent with the rhizomorphs of the Basidiomycetes) which are first observed on the tap roots, where they branch at intervals and form a small ball of hyphae below which a shallow depression in the bark is found. After penetrating the cortex the fungus attacks the cambium and stele, progressing downwards into the roots. A mycelial weft, composed chiefly of *Rhizoctonia*-like hyphae is formed at the collar of the plant but disintegrates and disappears as soon as the roots are rotted. The strand hyphae may hibernate on living or dead material and so form new centres of infection the following year at the periphery of the old spots. Lucerne was similarly attacked whilst fruit trees, so far as studied, appeared usually to be attacked at the crown. Inoculations made by burying inoculum in the soil between the plants were unsuccessful, but in the single case where roots of cotton were directly inoculated, a positive result was obtained.

In part two of this paper, contributed by Peltier and Samson, a study of the pathological anatomy of the disease is reported. Material showing various stages of infection on cotton and lucerne plants was examined, in addition to a few roots of the mesquite (*Prosopis glandulosa*) and the granjeno (*Momisia pallida*) which were also found to be attacked. The strand hyphae are composed of a large central hypha surrounded by bands of smaller ones, whilst acicular hyphae arise from triangular cells in the outer band. The central hypha branches profusely to form a dense weft and from this develops a hyphal wedge which pushes its way down until it reaches the cork cambium. This penetration is effected through lenticels, wounds of various kinds, or by direct penetration between the cork cells. On reaching the cork cambium the hyphae become narrower, penetrate in all directions, and advance into the cortex. In a short time sufficient cells are broken down to form a depression in the bark and finally the stele is also invaded, the mycelium growing profusely on the disorganized tissues.

JONES (G. H.). **The pathology of the Cotton plant in Nigeria.**—*The Empire Cotton Growing Review*, iv, 1, pp. 36–45, 1927.

In this article the following diseases of cotton in Nigeria are discussed in addition to others previously noticed in this *Review*.

Bacterial disease of cotton (*Pseudomonas* [*Bacterium*] *malvacearum*) was first recorded by Farquharson in 1912 under the name of 'black vein'. The disease is generally distributed in Nigeria, causing in the southern cotton belt area a loss of leaf area amounting to 15 per cent. or even more for native cotton, while damage to the stems may be considerable. The boll rot form of the disease may cause shedding of the flower buds up to 5·4 per cent. for American cotton, and 14·8 per cent. for native varieties; boll shedding may amount to 12 per cent. and 18·7 per cent. respectively, of all flowers produced, while mummied bolls may cause losses of 0·7 per cent. and 4·8 per cent. respectively, of the potential crop. In addition to this, damage results by the organism acting as one of the internal boll diseases [*R.A.M.*, v, p. 423]. A seed disinfection experiment on a plot, 0·1 acres in extent, following the method of Faulwetter (*Journ. Agric. Res.*, viii, 12, pp. 457–475, 1917) gave complete control of the disease throughout the season.

Anthracnose of cotton (*Colletotrichum* [*Glomerella*] *gossypii*) [*R.A.M.*, v, pp. 424, 425] was formerly considered to be a most important disease in Nigeria, but there is now little doubt that a great deal of the damage was due to *Bacterium malvacearum* followed by other fungi of secondary importance. The disease varies in intensity from year to year, attacking the potential fruit only, damage to the plant body being rare. It is possible that the most severe attacks in certain years are to be correlated with the occurrence of severe 'harmattan' weather with its accompanying low night temperatures.

A disease of cotton caused by a species of *Alternaria* is probably widespread, the damage being severe only in certain humid areas. The fungus produces on the leaves circular, brown 'zoned' spots which do not usually exceed half a centimetre in diameter. On the young fruit this disease can cause bud-shedding, boll-shedding, and boll 'mummification', but in most cases the damage is small. In humid areas, however, the disease may be responsible for almost half of the total boll-shedding in damp weather and a considerable amount of boll mummification.

Ramularia areola, *Sclerotium* [*Rhizoctonia*] *bataticola* (causing a damping-off), *Kuehneola desmium* and *Cercospora gossypii* are all cited as diseases of minor importance: while a species of *Fusarium* is said to occur commonly as a saprophyte [*R.A.M.*, v, p. 424].

PETCH (T.). **Studies in entomogenous fungi. XI. Empusa lecanii Zimm.**—*Trans. Brit. Mycol. Soc.*, xi, 3–4, pp. 254–258, 1 fig., 1926.

Three collections on *Lecanium viride* and one on an unnamed scale on *Cinnamomum ovalifolium*, thought very probably to be identical with the fungus described as *Empusa lecanii*, are discussed under this heading, but in the absence of authentic material from Zimmermann are not definitely determined. The fungus in each of these four collections consists of a very fine internal

mycelium (up to 1 μ in diameter), which may grow out and form pyriform 'conidia' 12 to 20 by 5 to 10 μ, which have an apical papilla, and finally become fuscous or pale brown. The scale is always finally covered with a growth of various Dematiae. Germination is usually by one or two lateral germ tubes, but in one collection the apical papillae burst with the production of a persistent globose vesicle, sometimes with the wall thickened on the lower side. The author is inclined to regard the present fungus as an aberrant *Pythium*, but leaves the matter in abeyance until the fungus has been successfully isolated.

PETCH (T.). **Entomogenous fungi. Additions and corrections, II.** —*Trans. Brit. Mycol. Soc.*, xi, 3–4, pp. 258–266, 1 fig., 1926.

The author gives English diagnoses of twelve new species of fungi which grow on insects or entomogenous fungi, including *Hirsutella nodulosa* on *Zeuzera coffeae* which is peculiar in not having a clava, and *Tuberculariа epimyces* on *Aegerita webberi* [*R.A.M.*, vi, p. 94]. Of old species discussed *Melanosphaeria circumdata* Saw. is thought from its description to be either a *Sirosphaera* or a *Sirosperma*. *Lycogala fragilis* Holm. (1781) was probably a *Beauveria*. No type or other specimen can be found at Kew of *Botrytis necans* Mass. [*R.A.M.*, iii, p. 569]. The diagnosis of *Botrytis rileyi* Farl., with a small emendment, suggests a *Spicaria*, and the type specimen should be compared with *S. prasina*. Specimens from Florida on *Anticarsia gemmatilis* proved to be the latter species [*R.A.M.*, v, p. 27]. *Isaria stellata* Cke on *Phenacoccus mangiferae* is not a fungus. The type specimen of *Oospora aphidis* Cke & Mass., shows an *Entomophthora* on the aphides; the reference to catenulate spores, and Cooke's figure (Vegetable Wasps and Plant Worms, pl. II, fig. 21) are based on the *Oidium* stage of a powdery mildew.

BROCQ-ROUSSEU, GUILLIERMOND, & DES CILLEULS (L.). **Étude d'un champignon pathogène du genre Monilia.** [On a pathogenic fungus of the genus *Monilia*.]—*Ann. de Parasitol. Humaine et Comp.*, v, 1, pp. 48–62, 5 figs., 1927.

The fungus forming the subject of this study was isolated from the sputum of a patient suffering from bronchomycosis, the clinical symptoms of which are described. On beerwort, the fungus produced at first almost exclusively round or ovoid yeast-like forms and later branched hyphae, some of which were very short, consisting of three to four cells, and unbranched, whilst others were long, elongated and branched, constituting a typical mycelium. The cells of the mycelium also budded off yeast-like forms, and frequently cells of an unusually large size were produced, measuring up to 40 μ in diameter as compared with 2·8 to 8 μ average size for the spherical cells, and 4 to 8·5 by 6 to 10 μ for the ovoid cells. The cultural characters of the fungus on various media are described, and its pathogenicity towards the rabbit and the guinea-pig was proved by inoculation experiments. It is referred to the genus *Monilia* Bonorden [? *Candida* Berkh.: *R.A.M.*, iii, p. 556], and is thought to be a new species, but is not named.

Fighting the Wattle bagworm.—*Farming in South Africa*, i, 10, p. 388, 1927.

This article describes the methods adopted by Dr. L. B. Ripley of controlling the bagworm [*Acanthopsyche junodi*] of the wattle [*Acacia mollissima*] by practising various modifications of plantation management designed to favour the diseases to which the bagworms are subject, and which, during an epidemic, will destroy 75 to 95 per cent. of them. Three such diseases are mentioned, two are caused by fungi, a 'white fungus' (*Isaria psychidae*) and a 'brown fungus' (*Entomophthora*) [a new species not yet described]. The third, known as polyhedral wilt or 'wilt disease', is caused by a filterable virus. These diseases are all favoured by a moist atmosphere, and consequently bagworm is more prevalent below the mist belt than in it. Various recommendations are given including late stripping (i. e. at 10 to 12 years), using plots not larger than 50 acres, arranging the plots so that younger trees are surrounded by older ones, and thinning heavily infected plantations after the worms have finished breeding in February. An appeal is made for widespread and continuous co-operation among all growers to combat this pest.

Straňák (F.). **Choroby a Škůdcové Lnu.** [Diseases and pests of Flax.]—*Ochrana Rostlin*, vi, 3, pp. 37–40, 3 figs., 1926.

Brief descriptions are given of the following flax diseases: wilt (*Fusarium lini*); seedling blight (*Sclerotinia libertiana* [*S. sclerotiorum*] or *Gloeosporium lini*); leaf and stem spotting (*Melampsora lini*); powdery mildew (*Erysiphe polygoni*); sooty mould (*Pleospora herbarum*), under the action of which the stems become yellow and very brittle, and the fibres are rendered useless; and root rot caused by *Olpidiaster radicis*. The last-named is stated to be favoured by damp weather, infected plants frequently recovering with the onset of dry spells, but it is dangerous on account of the rapidity with which it spreads and kills the plants under favourable conditions.

Buddin (W.) & Wakefield (Elsie M.). **On the life-history of a fungus parasitic on Antirrhinum majus, with some remarks on the genus Heterosphaeria.**—*Trans. Brit. Mycol. Soc.*, xi, 3–4, pp. 169–186, 8 figs., 1926.

In this paper the authors give an account of their further investigations of the shot-hole disease of antirrhinums caused by *Cercosporella antirrhini* [*R.A.M.*, iv, p. 94], which has become one of the most common and destructive diseases of antirrhinums in Great Britain.

Under certain conditions numerous pale pinkish acervuli are found on the leaf spots, and masses of sickle-shaped septate conidia of the *Cercosporella* type are borne on branched conidiophores. In pure cultures numerous blackish apothecium-like bodies were formed which remained quite sterile, until transferred to fresh tubes, when they produced conidia. Similar bodies were found on dead overwintered antirrhinum stems which had shown the disease during the previous summer. These bodies were found to be pycnidial fructifications belonging to the genus *Heteropatella*.

Proof of the connexion of this stage with the *Cercosporella* was obtained by inoculating living antirrhinums with *Heteropatella* conidia, and obtaining the characteristic spots and shot-holes of the *Cercosporella* on the leaves. Repeated attempts to obtain the ascigerous stage of the fungus have been unsuccessful; but by analogy with other species of *Heteropatella* the writers suspect that such a stage, should it appear, will prove to belong to the genus *Heterosphaeria*. The relationship of antirrhinum fungus with *Heteropatella* is further confirmed by its temperature relations which agree with those found by Vestergren for *Heteropatella cercosperma* (Rostr.) Lind.

The writers suggest that the *Cercosporella* stage in the life-history of a *Heterosphaeria* may be a new development correlated with the adoption of the parasitic habit; and further that the species on antirrhinum may have arisen as a saltation from *Heterosphaeria linariae* which occurs on dead stems of the related species *Linaria vulgaris*.

In a supplementary note [pp. 186–188] the authors, having obtained fresh material of the *Linaria* fungus, were able to compare it with their species on antirrhinum. From cultures and inoculation experiments it was shown that the two are slightly different morphologically, and very different physiologically. They therefore describe the pycnidial form of *C. antirrhini* found by them on *Antirrhinum majus* as a new species to which the name *Heteropatella antirrhini* is given, a Latin diagnosis being appended.

WOODWARD (R. C.). **A note on Botryodiplodia sp. on Choisya ternata in England.**—*Trans. Brit. Mycol. Soc.*, xi, 3–4, pp. 281–283, 1 fig., 1926.

In this paper the author records the occurrence of a species of *Botryodiplodia*, provisionally recognized as *B. theobromae*, causing a die-back of *Choisya ternata* at Wisley and Cambridge. In pure culture on sterilized *Choisya* twigs, the fungus formed pycnidia, the spores of which were found to be exceedingly resistant to desiccation. The pathogenicity of the fungus was proved by a number (8 out of 10) of successful inoculations on a healthy shrub, while the controls remained free from attack. Healthy branches were killed outright within one month after inoculation, and examination of infected regions showed that the wood and pith become very discoloured. Dark brown hyphae are seen in the vessels and medullary rays, and pass from cell to cell by way of the pits, whilst thin hyaline hyphae may also be found extending beyond the brownish areas. The death of the infected branch is thought to be probably due to the cutting off of the water supply by hyphae in the vessels.

LONGFORD (H. G.). **A new disease of Freesia.**—*Gard. Chron.*, lxxxi, 2094, p. 118, 1927.

During the past few years an obscure disease of freesias has been reported from various localities in England where it is said to be causing serious losses. The affected plants start to grow readily, and produce two or three healthy leaves, when suddenly one or more of the leaves develops brownish spots, and in the course

of a few days the spots merge together and the whole leaf becomes withered. Badly infected plants collapse entirely, generally before showing any sign of flowering. No fungus has been detected in the leaf tissues and at present no cause can be assigned to the disease.

DRAYTON (F. L.). **Diseases of ornamental plants.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 7–9, 1926.

Experiments were carried out to test the effect of uspulun, Bayer compound, kalimat (each at 25 per cent. strength), and kalimat (5 per cent.), applied as waterings to seeds and young plants on heavily infected soil, in the control of the wilt of Chinese asters (*Fusarium conglutinans* var. *callistephi*) [*R.A.M.*, iv, p. 527], all of which gave negative results. Another series of experiments showed that asters are susceptible to infection at any stage of their growth up to blooming time.

In discussing quarantine measures to be applied to the importation of ornamental plants and bulbs into Canada, the Division of Botany recommend, in view of their experience during the year, that not more than two per cent. of disease should be permitted entry in the case of stock for propagation, and not more than five per cent. in the case of bulbs for bedding and forcing. In addition, the consignees should be notified of the presence of any disease in the shipment, and instructions sent covering the recognition and removal of the diseased specimens.

MOLISCH (H.). **Parasiten [Parasites]**—*ex* Pflanzenbiologie in Japan auf Grund eigener Beobachtungen. [Plant biology in Japan, based on my own observations.]—pp. 158–161, 2 figs., Jena, Verlag von Gustav Fischer, 1926.

In the chapter on parasites of this book the author makes the following references of phytopathological interest.

Parasitic fungi, stated to cause variegation of bamboo canes in Japan include (1) an undetermined species which forms spots on the surface of the canes of a species of *Phyllostachys* growing in south China; (2) *Micropeltis bambusicola* which stains the canes of an unnamed species of bamboo occurring on the Hakusan mountains (Kaga); and (3) *Miyoshia fusispora* Kawamura, which attacks the smooth canes of a strain of *Arundinaria narihira* in the provinces Mimasaka, Misaka, and Kochimura. The last named penetrates the stem to a depth of about 2 mm., and invades the cells of the parenchyma and of the bast, causing them to swell very considerably. The affected tissues assume a yellowish brown discoloration, and the resulting spots, which appear clearly on the surface, form very decorative patterns. Such canes are highly prized for the manufacture of walking sticks, flutes, and ornaments.

Witches' brooms are said to be of frequent occurrence in Japan, particularly on cherry trees and bamboos. On the former they are caused by *Taphrina pseudo-cerasi* Shirai. According to the author's observations the branches attacked by this fungus produce very few flowers, if any at all, and are very conspicuous in the spring owing to the fact that they develop leaves much earlier

than the healthy shoots. It was also noted that the shoots on attacked branches continue to grow much later in the season than normal.

The formation of witches' brooms on bamboos (chiefly on *Phyllostachys bambusoides*, but occasionally also on *Arundinaria chino*, *P. nigra*, and *P. puberulla*) is attributed by Miyake to a fungus believed to have been introduced into Japan from China, and which he named *Aciculosporium take*. The symptoms of the disease are a thick branching of the canes, stunting and gradual discoloration of the leaves, and the drooping of the affected shoots.

Witches' brooms are also occasionally found on *Abies firma*, *Thujopsis delobrata* (caused by *Caeoma deformans*), *Paulownia imperialis* (caused by *Gloeosporium kawakamii* Miyake), and on *Pinus thunbergii*.

BARTLETT (A. W.). **On a new species of Urophlyctis producing galls on Lotus corniculatus Linn.**—*Trans Brit. Mycol. Soc.*, xi, 3–4, pp. 266–281, 4 pl., 1926.

The gall disease of the bird's-foot trefoil (*Lotus corniculatus*) described in this paper, was found in a field about 11 miles north-west of Newcastle, Northumberland. The galls occurred by no means plentifully in the dampest part of a field, mostly at the collar of the affected plants, which otherwise showed no sign of disease, but occasionally smaller galls were found on the creeping underground stems. They are spherical or ovoid, generally about the size of a garden pea, pale yellow at first but later pale brown in colour, and with a smooth and slightly scurfy surface. The gall is composed of thin-walled parenchymatous cells and numerous rounded cavities of various shapes and sizes, mostly filled with brown resting sporangia characteristic of *Urophlyctis*. Irregular vascular bundles traverse the gall in all directions, and the outermost cells are mostly empty and dead.

The resting sporangium is hemispherical, and a distinct angular ridge separates the more convex from the flatter surface. The former possesses characteristic ornamentations in the form of radiating grooves and ridges, and in this respect the species differs from any other member of the genus. It is accordingly named *U. potteri*, a Latin diagnosis being given. Attached to the centre of the base of the sporangium by a very short stalk is a transparent vesicle which the writer terms a collecting cell (Sammelzellen of Büsgen; turbinate cells of Jones and Drechsler—*Journ. Agric. Res.*, xx, pp. 295–323, 1920).

In development the fungus closely agrees with other species of *Urophlyctis* except in a few minor details. Infection of the host has not been seen, but the development of the resting sporangium from a young stage of the collecting cell, with its distal haustorium, is described. A collecting cell also gives rise to other collecting cells which arise from near the apex as fine hyphae with enlarged ends, the number, in the present species, not exceeding three. No temporary or summer sporangia have been seen, and all attempts to make the resting sporangium germinate have been unsuccessful. The cytology of the species is described and a bibliography of 33 titles appended.

ESMARCH (F.). **Der Wurzeltöter (Rhizoctonia violacea Tul.).** [Violet root rot (*Rhizoctonia violacea* Tul.).]—*Die Kranke Pflanze*, iv, 1, pp. 4–6, 1 fig., 1927.

This is a popular account of the symptoms, etiology, and control of the violet root rot disease (*Rhizoctonia violacea*) [*R. crocorum*], especially with regard to its attack on clover, lucerne, turnips and asparagus. No perfect form has as yet been related to this fungus, and it is an open question whether the disease on these hosts is to be attributed to one or to several distinct species. For control, the usual digging up and burning of affected plants, combined with soil sterilization by means of a 1 per cent. solution of formaldehyde or other soil disinfectants, such as uspulun, is recommended for small areas. On a large scale the only method of procedure is to cease growing susceptible crops on infected soil for some time. The writer points out the danger of using diseased crops as food for stock, as the infection may be spread by manure. Too high a soil moisture or too long a drought may render the plants more susceptible to the disease.

PIETERS (A. J.) & MONTEITH (J.). **Anthracnose as a cause of Red Clover failure in the southern part of the Clover belt.** *U.S. Dept. of Agric. Farmers' Bull.* 1510, 17 pp., 9 figs., 1 graph, 1 map, 1926.

Anthracnose of red clover (*Colletotrichum trifolii*) [*R.A.M.*, iv, p. 595] is reported from practically all parts of the clover belt of the United States, but is most severe in the south. Although the lesions due to the causal fungus are to be found on petioles, stems and leaves, the greatest damage is done when it attacks the crown or the tap-root, and in such cases there is often no recovery. The dying off due to this disease is extremely rapid, and complete stands of clover may be utterly destroyed in two or three weeks in September. The disease is at its worst in hot, damp weather, while spattering rain is very effective in spreading the conidia. No control is known except the use of seed from a strain that is known to be resistant to the disease, or of seed produced from a stock propagated over a considerable period in the infected area. The importance of organized efforts on the part of local and State authorities to stimulate the production of resistant seed and to create a demand for such seed by the farmers is emphasized. When seed of unknown origin must be planted, a beneficial result has been gained by late summer or early autumn sowing.

BROOKS (A. N.). **Studies of the epidemiology and control of fireblight of Apple.**—*Phytopath.*, xvi, 10, pp. 665–696, 1 fig., 1926.

In these studies on the fireblight (*Bacillus amylovorus*) of apple as it occurs in Wisconsin, the author found that the organism overwintered in the blighted twigs and in cankers, in the apparently healthy tissue adjacent to the dead areas, but never in the latter. The organism was isolated from the tissues as far as one inch from the margins of dormant cankers. From 2·5 to 11·0 per cent. of the cankers and 0·6 to 2·5 per cent. of the blighted twigs examined in 1925 were found to overwinter the bacillus, a sufficient survival

to provide a plentiful source of inoculum for initial infection in the spring.

Study of the bacterial exudate revealed the fact that this secretion occurred most plentifully at temperatures between 65° and 85° F., and at relative humidities above 80 per cent. Alternate cloudy and sunny periods favoured exudation. *B. amylovorus*, when exposed in small drops of the exudate to direct sunlight, was killed in 22 hours. In small blighted twigs cut from the trees, and exposed to sunlight for 2 hours daily in summer, the bacteria remained viable for 15 days but were killed in 25 days.

Rain was found to be an important factor in the local spread of blight; 90 per cent. of the twig infection studied in 1925 was ascertained to have been transmitted by this means. Insects such as *Aphis avenae*, *A. pomi*, and *Empoasca mali* were found to be effective spreading agents in the experimental orchards. In addition to the factors already discussed, the presence of susceptible varieties, heavy blossoming and vigorous vegetative growth are also considered to promote epidemics of the disease.

As regards the entrance of the parasite into the plant tissues, such natural openings as nectaries and hydathodes were found to provide a possible passage, but all attempts to secure stomatal infection failed. The ordinary means of entrance, however, seemed to be through fresh wounds, especially vein wounds, though after 36 to 48 hours in the case of a leaf, and up to 72 hours in that of a stem, wounds ceased to permit infection by the fire blight organism.

Of the apple varieties grown in Wisconsin, Dudley, Duchess of Oldenburg, McIntosh, and Northwestern Greening are cited as being fairly resistant, but even these will become severely blighted if too heavily fertilized and cultivated so as to produce an abnormal succulent growth.

As a means of control comparatively good results were obtained by scraping the epidermis from active cankers and adjacent bark, and painting the wound with a solution containing 1 gm. mercuric chloride, 1 gm. mercuric cyanide, 500 c.c. glycerine, 250 c.c. of 95 per cent. alcohol, and 250 c.c. water or with a mixture of carbol-fuchsin and gentian violet. Cutting out blighted twigs and cankers was successful in the earlier part of the season, but later blossom blight was spread by pollinating insects which carried the infection from neighbouring trees. Spraying experiments for the control of these insects produced no very useful results.

WICKENS (G. W.). **Apple scald.**—*Journ. Dept. Agric. Western Australia*, Ser. 2, iii, 4, pp. 482–483, 1926.

Further tests on the value of wrapping apples for the prevention of scald were carried out in 1926 with Granny Smith apples at Perth, oiled paper prepared in Australia being substituted for the American product used in previous experiments [*R.A.M.*, v, p. 369]. The fruit was kept in cold storage at 33° F. from April 30th till October 1st, when it was unwrapped and, nine days later, was critically examined. A bushel case of fruit was used for each treatment. The unwrapped apples were all more or less badly affected with scald; those wrapped in ordinary sulphite tissue

paper showed 32 scalded; those wrapped in oil paper of 7 lbs. substance (weight of 480 sheets) showed 5 with scald; whilst the best results were obtained from apples wrapped in a better quality oiled paper of 10 lbs. substance which showed one only very slightly scalded. The cost of the latter paper works out at about 6*d.* per bushel case against 2*d.* for ordinary sulphite paper, but the use of the oiled paper is considered to be well worth the extra expense. The Australian paper proved to be equally as efficient as the American in addition to being much cheaper.

SOUTHEE (E. A.) & BROOKS (F. T.). **Notes on a pycnidial fungus associated with a dying-back of Apple branches.**—*Trans. Brit. Mycol. Soc.*, xi, 3-4, pp. 213–219, 7 figs., 1926.

In this paper the authors describe a somewhat uncommon die-back of the branches of apple trees affecting chiefly the variety Lord Derby in Cambridgeshire. The bark is affected at first in long strips on one side of the branch and a kind of canker is formed. The disease appears to spread down the bark and the branches so affected die back. The superficial tissues peel away from the underlying parts and so give the bark a characteristic appearance. Associated with the disease is a fungus forming greyish-black stromata containing one or several pycnidia, more than one chamber being occasionally connected with a single ostiole. The spores are generally hyaline, globose to oval, and average 10 by 7·5 μ in size. The fungus although at first confined to the bark ultimately penetrates the wood causing it to become discoloured. The spores germinate either directly by the production of two or three germ tubes, or much more commonly bud off from one end a bunch of secondary spores which later germinate to form a mycelium. Small rod-like spores, not seen in nature, were found in the pycnidia under cultural conditions, but were never seen to germinate.

There is some uncertainty about the identity of the fungus, but the authors refer it provisionally to *Cytosporella fructorum* [*R.A.M.*, i, p. 62] which has been described as occurring on *Pyrus* fruits in Belgium. Inoculation experiments were unsuccessful in reproducing the disease in wounds on Lord Derby apple trees, so that the pathogenicity of this fungus is not definitely proved. The authors suggest that the fungus behaves as a parasite only when the trees are already weakened from some other cause.

ANDERSON (H. W.). **The effect of sodium silicofluoride sprays on the Peach and on the control of bacterial spot.**—*Science*, N.S., lxv, 1671, pp. 16–18, 1927.

Following preliminary experiments carried out by the author in 1925 [*R.A.M.*, v, p. 504] spraying tests were conducted in 1926 in two widely separated orchards in Illinois, on the effect of a dilute solution (2 lb. in 50 galls. of water) of sodium silicofluoride on bacterial spot of the peach [*Bacterium pruni*].

In one orchard weekly applications from June 21st to July 26th gave perfect control on the fruit, the sprayed trees showing only 0·48 per cent. diseased fruit against 86·7 per cent. on the controls. In the other orchard, sprays were applied at 10-day intervals and yielded

11·5 per cent. diseased fruit against 69·5 per cent. on unsprayed trees. It was observed that fruit in the treated plots ripened 4 to 6 days ahead of that in unsprayed plots, was somewhat smaller in size, of a higher colour, and with a dark to yellowish-green area at the tip varying considerably in size and shape, whilst the taste of the entire fruit was insipid and in some cases rather bitter. A similar effect was observed in 1924 on some peach trees sprayed with Flu Sul, a commercial product containing barium fluoride. The control of the disease on the leaves was not so successful as that on the fruit, 38·3 per cent. of the leaves being diseased from one of the sprayed plots as compared with 84·5 per cent. on the controls. It is not considered safe for growers to use any spray containing sodium silicofluoride until further experiments have been made to ascertain the effect of climatic conditions on the amount of injury.

In conclusion the author suggests that the wide-spread infection occurring in dry seasons, such as 1925 and 1926, may be due to the organism being carried to the leaves and fruit in the dust arising during the process of cultivation and from high winds.

CARNE (W. M.). **Leaf curl of Peach and Nectarine (Taphrina deformans).**—*Journ. Dept. Agric. Western Australia,* Ser. 2, iii, 4, pp. 472–474, 1 fig., 1926.

Leaf curl of peach and nectarine (*Taphrina deformans*) is stated to be of common occurrence in Western Australia, especially in moist seasons, and in addition to attacking the leaves and shoots it has occasionally been found also on the fruits. The varieties Elberta, Lady Palmerston, and China Flat are especially susceptible and seedlings are said to be very liable to infection. A detailed description of the economic effects of the disease are given and the following sprays recommended for its control: one spraying with commercial lime-sulphur (1–10), Bordeaux mixture (6–4–40), or Burgundy mixture (6–9–40) to be applied at any time during the dormant period.

HOPKINS (C. J.). **Armillaria root-rot of fruit trees.**—*Farming in South Africa,* i, 10, pp. 391–392, 2 figs., 1927.

This is a popular account of root-rot of fruit trees caused by *Armillaria mellea.* This disease, not previously recorded as causing serious damage in South Africa, has now been found to be fairly common at Wynberg, Cape Province, where the wooded nature and dampness of the countryside are conducive to the growth and spread of the causal fungus. The host chiefly attacked in South Africa up till now has been the peach, but oak, and in one locality a myrtle [*Myrtus communis*] hedge have been found affected. The symptoms of the disease including the characteristic rhizomorphs and fruit bodies of the fungus are described and the usual control measures consisting of trench digging and clearing away dead stumps are advocated.

SIBILIA (C.). **Il deperimento degli Albicocchi.** [The wilting of Apricots.]—*Boll. R. Staz. Pat. Veg.,* vi, 4, pp. 377–380, 1926.

A disease of apricots characterized by a gradual wilting, first

of the young branches and then of the whole tree, has been observed on a large number of trees in Tuscany. Sections through wilted branches showed in most cases a brown discoloration in a sector of the wood. In the early stages of the disease, the branches show no outward sign of attack, and desiccation only follows in the advanced stages, often a year or more later, when the cambium also becomes browned and the cortex dies.

This disease is apparently closely similar to that described by Czarnecki in California [*R.A.M.*, iii, p. 47], and referred to a species of *Verticillium*, but in the present case no *Verticillium* has yet been found. Among the fungi isolated from infected tissues, one developed abundant brown, elongated, claviform, or pluriseptate conidia resembling *Clasterosporium*, and is probably *C. carpophilum* (*Coryneum beijerinckii*). Chabrolin attributes apoplexy of apricots in the Rhone valley to this fungus, but in the present instance it causes only a superficial type of infection and is not responsible for the discoloration of the wood. A second fungus of the genus *Cytospora* was found to be associated with the disease, but is also considered to be purely saprophytic. This type is common on dead tissues of many fruit trees affected by wilt.

C. (B.). **Verticillosa Třešní.** [Verticilliosis of the Cherry.]—*Ochrana Rostlin*, vi, 1-2, p. 32, 1 fig., 1926.

Sweet cherry trees [*Prunus avium*] growing in a low-lying, water-logged locality of Czecho-Slovakia, were found to be attacked by *Verticillium albo-atrum* [*R.A.M.*, v, p. 495]. The outward symptoms of the disease were the yellowing of the leaves, their premature shedding, no production of fruit, and the final death of the trees. According to observations, the fungus penetrates through the roots into the trunk and the large limbs, the wood of which presents a typical dark brown, sharply defined central discoloration. The infected trees cannot be cured and should be immediately removed. It is believed that infection can be prevented by a good drainage of the soil and by avoiding the cultivation of potatoes in the neighbourhood of cherry trees.

Nattrass (R. M.). **Further experiments on the control of American Gooseberry mildew.**—*Journ. Min. Agric.*, xxxiii, 11, pp. 1017–1022, 1927.

In continuation of his work on the control of American gooseberry mildew [*Sphaerotheca mors-uvae*: *R.A.M.*, v, p. 677], the author records in this paper the results of further experiments which were carried out in the Bristol area during 1926.

In the first series one application of Burgundy mixture (8–20–100) was tested against one or two applications of ammonium polysulphide and soft soap (½ gall. and 5 lb., respectively, in 100 galls. water). Seven plots of the Whinham's Industry variety were used for the experiment; the first applications were given immediately after the flowers had set, on April 22nd, and the second spraying where applied, on May 18th. The Burgundy mixture plots gave 482 lb. clean fruit and 4·3 per cent. mildewed, against 143½ lb. clean and 39·9 per cent. mildewed from the control plot, whilst the plots sprayed once and twice with ammonium poly-

sulphide-soap gave 456 lb. and 502 lb. clean and 15·5 per cent. and 5·6 per cent. mildewed fruit, respectively. No damage occurred except on the plots sprayed with Burgundy mixture, where after about ten days a certain amount of spotting was observed.

In the second series of experiments, Whinham's Industry bushes were again used, and the spraying done on the same dates as above, two applications being given in each case. Of the sprays tested ammonium polysulphide and soft soap (½ gall.–6 lb. in 100 galls. of water) gave 169 lb. clean fruit and 16·3 per cent. mildewed; proprietary soda sulphur compound and soft soap (10 pints–6 lb. in 100 galls.) gave 122 lb. clean and 14 per cent. mildewed; washing soda and soap (18 lb.–10 lb. in 100 galls.) gave 95 lb. clean and 30·1 per cent. mildewed, against 66 lb. clean and 53·7 per cent. mildewed from the control plot. Heavy showers of rain after the second spraying much impaired its value, but the poor control obtained was thought to be largely due to the situation of the plot, which was partly overshadowed by tall elms, being especially favourable to the disease. The author considers that the soda and soap acts mainly as a direct killing spray and must be applied as often as weather conditions render it necessary.

WARDLAW (C. W.). **Lanarkshire Strawberry disease. A report for the use of growers.**—Pamphlet issued by Botany Dept. University of Glasgow, pp. 1–38, 4 pl., 1926.

The Lanarkshire strawberry disease, considered to be distinct from the red plant disease now under investigation in England [*R.A.M.*, v. p. 470] was first observed in Scotland about 1920 and has since spread to a very considerable extent, being particularly prevalent in the years 1922 and 1926. The losses due to the disease have been so considerable that it is now regarded as being in the nature of an epidemic.

The affected plants are dwarfed and show discoloured leaves which often have red margins; they fail to fruit, and there is a decline in the formation of runners. Young plants have a stunted, sickly, yellowish appearance, the general symptoms resembling those of starvation. The disease may appear on young roots as blemishes or discolorations which later on resemble the effects produced by damping-off, and a similar condition is observed in the stouter roots as the dying-back takes place. The roots of diseased plants may only extend to a depth of two to four inches in the soil and are mostly brown or black and rotted. The stout primary roots are rotted at the tips, and in most cases are denuded of their fine fibrous rootlets.

Fungus hyphae were found in the diseased tissues of the roots, and attempts made to isolate organisms from such tissues yielded in twenty-two experiments a species of *Pythium*, in three instances a fungus resembling a *Fusarium*, and in two others a species of *Botrytis*. In order to test the pathogenicity of the *Pythium*, plants of the John Ruskin variety were grown with roots free from fungus infection by allowing runners to strike in pots of sterilized soil, care being taken to avoid contamination from various external sources. When the plants were well rooted the pots were inoculated with the *Pythium* cultures. After 14 to 21 days the plants

developed typical symptoms of the disease whilst the control plants remained healthy. The *Pythium* was again isolated from the inoculated pots. Further experiments, however, showed that another of the fungi isolated [unspecified] was also capable of attacking the roots, and it is thought that a number of soil fungi may prove to be capable of acting in a similar manner, under unfavourable soil conditions, though observations are still too incomplete to make any definite statement on this point.

No control measures can be recommended beyond agricultural treatment which tends to improve the general condition of the soil and the free healthy rooting of the plants.

[A somewhat abbreviated account of this work has appeared in the *Scottish Journ. Agric.*, x, 1, pp. 8–12, 1 pl., 1927.]

ROSE (D. H.). **Diseases of Strawberries on the market.**—*U.S. Dept. of Agric. Circ.* 402, 7 pp., 1 graph, 1926.

In this circular, the results are given for the inspection of rots of 5,370 car loads (5·5 per cent. of the total) of strawberries at terminal markets in the United States during the 7-year period ending 31st December, 1925. Nearly one third of the cars inspected showed no rot and the total percentage rot for all the cars amounted to 5·8 per cent. Of this approximately 58 per cent. was due to *Rhizopus* [*nigricans*] and the remainder for the most part to grey mould [*Botrytis* sp.] and also to leather rot [*Phytophthora cactorum*: *R.A.M.*, v, p. 565] and various unidentified rots. All rots were more serious in wet than in dry seasons but *Rhizopus* appeared each year to some extent; its occurrence depends largely on the way the fruit is handled and on the method of refrigeration in transit, the fungus being unable apparently to enter the fruit except through skin breaks, or to develop to any serious extent if the temperature is kept below 50° F.

BERKELEY (G. H.). **Report of the Dominion Laboratory of Plant Pathology, St. Catharines, Ontario.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 56–66, 3 figs., 1926.

A spraying experiment was made to test the effect of various treatments with Bordeaux mixture and lime-sulphur in the control of apple scab [*Venturia inaequalis*] in an orchard of 1,280 trees at Vinemount, Ontario. The outstanding features of the results was the great difference in yield between the sprayed (average for 15 trees, 7,363 apples, 93·7 per cent. clean) and unsprayed (1,112 apples, 15·4 per cent. clean) blocks of trees. This difference was mainly due to a severe infection of the blossoms early in the season, which resulted in the blighting of the flowers and premature dropping of the fruit.

Comparative tests to ascertain the effect of spraying sour cherry trees with Bordeaux mixture and with lime-sulphur on the size of the cherries showed that the fruit from the Bordeaux-sprayed trees was smaller than that from lime-sulphur-treated trees, the difference in the weight of 1,000 cherries being 1 lb. 1 oz. in favour of the latter.

Scab [*Cladosporium carpophilum*] of the peach is stated to have

been on the increase during the last three years in some localities of Ontario. Satisfactory results are claimed to have been obtained in 1924 and 1925 in the control of this disease by spraying the trees with dry mixture (wettable sulphur: superfine sulphur 64 lb., hydrated lime 32 lb., calcium caseinate 4 lb.) about four weeks after the blossoms have fallen.

A plantation of the Eaton variety of strawberry exhibited early in May, 1925, characteristic symptoms of mosaic and dwarfing, while the Premier and Cooper varieties growing in close proximity remained perfectly immune.

Raspberry mosaic [*R.A.M.*, v, p. 534] continues to be general in the Niagara peninsula. Data collected from the first year's picking of an experimental plot of thirty mosaic and thirty healthy bushes indicated that in cases of heavy infection with the disease the loss of yield per acre may amount to as much as 1,125 lb. The recommendations for the control are that old, badly diseased plantations should be dug up; one- or two-year-old plantations with a small percentage of mosaic should be carefully rogued; and new plantations should only be started with certified healthy stock. A promising seedling for immunity from mosaic is stated to be Adams 87, which during the last three years has failed to show even one case of infection.

Good results in the treatment of vine chlorosis were obtained in one vineyard by applications in 1924 and 1925 of iron sulphate, magnesium sulphate, or a combination of iron and magnesium sulphates (at the dose of two teaspoonfuls) on the soil around the main stalk of the affected vines.

CHODAT (F.). **Recherches expérimentales sur la mutation chez les champignons.** [Experimental investigations on the mutation of fungi.]—*Bull. Soc. Bot. de Genève,* xviii, 1, pp. 41–144, 13 pl., 12 figs., 2 diags., 6 graphs, 1926.

After reviewing the work of other investigators the author gives in this paper the results of his own studies on mutation in *Aspergillus ochraceus* and *Phoma alternariaceum.*

A culture of *A. ochraceus* (obtained from the Rothamsted Experiment Station) distinguished as strain α showed sectoring in which the mutant γ differed from the normal culture in the more slender structure of the conidiophores, which measured 4 to 5 μ as compared with 9 to 10 μ for α, the less numerous spores, the intracellular production of a pigment, and its increased capacity for absorbing nitrogen. The diameter of the spores was not affected. Each strain was re-isolated from single spores and maintained in culture throughout the year; in spite of the variety of media used, the distinctive characters persisted for more than forty generations. The strain γ has continuously furnished mutants of the type of the original strain whereas the converse has not been realized. Culture media affected the mutant to some extent, and it was observed that a vigorous form of mutant was obtained on impoverished media.

The culture of *P. alternariaceum* (obtained from the Lister Institute) produced five mutants as distinct from the original strain α, referred to as b, W, G, V, and γ, distinguished from each

other by small differences similar to those described above, but the length of the pycnospores is sometimes modified in the mutant. The two extremes α and γ are much more stable than the intermediary types, particularly G which might almost be termed a sub-strain in the sense of De Vries. The mutations observed produced forms tending towards forms already known but never reaching complete identity with them. In *Phoma*, mutation frequently implies the acquired faculty of readily assimilating carbohydrates, but certain exceptions entailing the loss of this faculty were noticed.

Discussing the causes of mutation the author states that, in his opinion, the culture medium which evidently has some influence on the mutation of fungi should be regarded as a detector which renders visible a pre-existing alteration rather than as a causal agency of mutation. The inability of pure line selection to alter the characters of the mutant has clearly been shown in the case of *Phoma* γ, confirming the results obtained by La Rue with *Pestalozzia guepini* [*R.A.M.*, i, p. 452]. Finally by means of a diagram the author demonstrates that strains of *Phoma* showing the closest resemblance are not necessarily those of the nearest approaching parent, and the systematic grouping of the micro-species is considered to be rather the expression of convergence than of phylogenetic reality.

PETRI (L.). **Applicazioni della luce di Wood in Fitopatologia.** [Application of Wood rays to phytopathology.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 345–348, 1926.

In this paper the author describes a method of diagnosing leaf injury produced by toxic gases coming from factories by means of Wood rays. These rays are selected from ultra violet rays by filtration, and they have the property of rendering fluorescent a great number of substances normally non-fluorescent. The leaves to be examined are dried, powdered, then extracted with water at 50° C. for one hour; the supernatant liquid is then decanted and exposed to the rays. Injured leaves of *Plantago major* and the vine yielded a liquid which gave a greenish-white or bluish discoloration, quite distinct from the wine colour obtained when normal leaves were used. These tests indicate that the detection of damage by sulphur dioxide is possible by this method but not that due to chlorine. Further experiments are necessary to extend this method of diagnosis to other plants.

NEWHALL (A. G.). **Some factors in greenhouse soil sterilisation.** —*Bimonthly Bull. Ohio Agric. Exper. Stat.*, xii, 1, pp. 21–25, 1 fig., 1927.

The effectiveness of soil sterilization for the control of certain diseases of vegetables grown under glass, is said to depend upon the thorough heating of the soil, a temperature of at least 150° F. being regarded as necessary.

Temperature readings taken in several commercial greenhouses near Cleveland [Ohio] while soil sterilization was in progress showed that as much as 100° variation in temperature may occur between readings taken at only 6 inches apart at the same depth of soil.

Investigations showed that these variations can be overcome to a great extent by thoroughly loosening the soil and by sterilizing when the soil is as dry as possible. A pressure of 50 lb. gave the deepest penetration, and no advantage was obtained by raising it higher than this. Under strictly comparable conditions the harrow method of sterilization proved to be much less effective than the pan method, whilst with the buried tile method when the steam had penetrated to the surface the temperature was found to be well above 160° at a depth of 2 inches and still higher on approaching the hot tile placed at a depth of 12 inches.

SMOLÁK (J.). **Rostlinná Pathologie.** [Plant pathology.]—3rd revised Edition, 364 pp., 217 figs., Prague, Česka Graficka Unie A.S., 1926.

The present work is meant to serve as a text-book of plant pathology for students at the Higher Schools of Agriculture in Czecho-Slovakia, and deals for the most part with plant diseases which occur in that country. The first part contains a general introduction to phytopathology, together with a discussion on prophylactic and control measures. The second part is divided into the following chapters: physiological diseases; bacterial diseases; virus diseases; fungus diseases; diseases of obscure origin, viz., lodging of cereals, chlorosis, gummosis, and intumescences; phanerogamic parasites; diseases caused by animals and insects, and teratology. The text is furnished with a large number of illustrations, many of which are original.

JOHNSON (J.). **Some points of view on the plant virus problem.**—*Phytopath.*, xvi, 10, pp. 745–751, 1926.

In this paper, the author discusses various general aspects of the problems arising in connexion with virus diseases.

With regard to the specificity of viruses, the data are conflicting, a limited host range apparently obtaining with certain viruses, while the work of Elmer [*R.A.M.*, iv, p. 754] would indicate that a virus may not be specific to species, genera, or families. The existence of combinations of viruses in one plant is touched upon, and the possibility of separating such combinations by the use of differential hosts [ibid., v, p. 509], by allowing the viruses to age outside the host, and by the selective killing action of heat and chemicals is discussed.

Confirmatory evidence of an insect phase in the life cycle of diseases of this type is required, especially since, in the more typical viruses, insects are considered to be merely mechanical agents of transmission.

With regard to environmental conditions, moisture is said to play no part in the infection of a virus disease. Temperature exercises an influence, but whether this acts directly on the virus, or indirectly on it through the host, is not known. In the case of the potato mosaic, the masking of the symptoms at high temperatures above 25° C. is most easily interpreted on the basis that the virus is reduced in activity in some manner. Infection, however, develops much more quickly on healthy inoculated plants placed at 25° for some days than on plants kept constantly at 15°,

so that the virus does not appear to be attenuated at the higher temperatures. Different viruses, however, react differently to increase in temperature.

The existence of symptomless carriers is open to some doubt, but the potato may prove to be an example of such a host since apparently healthy potatoes appear to be commonly infected [ibid., v, p. 119].

Viruses appear in general to be resistant to heat, desiccation, putrefaction, chemicals, and ageing, though some are comparatively sensitive to adverse conditions. The size of the virus particle has always given rise to controversy, but their passage through collodion membranes [see above, p. 194] is considered to show that they cannot be much larger than the ordinary protein molecule.

The plasmodium-like bodies, commonly found in certain virus diseases, are regarded as probably a result, rather than a cause of the disease. The possibility of culturing the virus in vitro has been asserted [ibid., iv, p. 688] and refuted [ibid., iv, p. 689; vi, p. 191] and must for the present remain in dispute.

In conclusion the author suggests, as a result of investigations on viruses secured from apparently healthy potatoes [ibid., v, p. 119], either that the plants are extremely good examples of symptomless carriers, or 'that the normal or abnormal protoplasm of the potato is capable of attacking as it were the tobacco plant'. The word viroplasm has been coined to cover the meaning of the latter hypothesis.

SAMUEL (G.). **Note on the distribution of mycorrhiza.**—*Trans. Roy. Soc. S. Australia*, l, pp. 245-246, 1926.

In this note the author gives the results of a preliminary survey of the distribution of mycorrhiza, especially of the endotrophic type, in South Australia. The investigation was started primarily on account of an obscure disease of oats prevalent near Mount Gambier and Penola in which the roots of affected plants were extensively invaded by a fungus with the typical characters of endotrophic mycorrhiza, and secondly by the behaviour of seedlings of *Pinus insignis* planted in recently cleared ground, some of which grew well and were of a good green colour whilst others remained small and yellowish. Examination of the roots showed the healthy pines to be abundantly supplied with ectotrophic mycorrhiza whereas in the stunted specimens mycorrhiza were lacking or poorly developed. Roots of *Eucalyptus rubida*, the dominant tree in the area, were also found to be possessed of ectotrophic mycorrhiza.

The endophyte was found on species belonging to the families Leguminosae (27 species), Gramineae (30 species), Liliaceae, Ranunculaceae, Violaceae, Geraniaceae, Euphorbiaceae, Rosaceae, Plantaginaceae, and Compositae. The determination of its presence was based in all cases upon the occurrence of the characteristic non-septate mycelium in the inner layers of the cortex and forming 'arbuscules' or 'sporangioles', usually just without the endodermis, and in some species 'vesicles'. The characteristic lemon-shaped spores were only found on one occasion. Considerable variation exists as to the relative abundance and development of arbuscules,

sporangioles, and vesicles in the roots of different plants, which the author hopes to discuss in detail in a later paper.

KŘIŽ (K.). **O napadení nadzemních částí Bramborů rakovinou.** [On the infection of the aerial organs of the Potato by wart disease.]—*Ochrana Rostlin*, vi, 4, pp. 80–83, 2 figs., 1926.

In 1924 and less frequently in 1925, owing to the dryness of the weather, instances of infection of the aerial parts of the potato by *Synchytrium endobioticum* are stated to have been observed at Šluknov [Czecho-Slovakia]. According to the brief description given, infection occurs through contact of the aerial organs with the soil, particularly in wet periods, producing characteristic lesions on the leaves, stems, and buds, in the form of swellings varying in size from almost imperceptible warts to fairly considerable dimensions, and resembling in aspect the lesions on the tubers. Infected buds put forth stunted, rosette-like leaves, of a lighter green colour than normal. Microscopical examination shows the presence in the affected tissues of the causal organism in all stages of development. The infected organs rapidly die off and assume a black discoloration, and are considered capable of carrying the infection from one year to the next.

Potato experiments, 1926.—*Govt. of Northern Ireland, Min. of Agric. Leaflet 7 (revised 1926)*, 13 pp., 2 pl., 1926.

In the revised edition of this leaflet, in addition to the popular description of wart disease of potatoes [*Synchytrium endobioticum*] which is reprinted [*R.A.M.*, v, p. 445] the results of the tests carried out in 1926 of the cropping capacity of new immune varieties are described.

The tests on a large scale were carried out at Stormont and at Strabane, together with a series of smaller tests on farms in scheduled districts. Blight [*Phytophthora infestans*] was successfully controlled in each case.

The average results of the large scale trials, given in tabular form, show that the immune varieties Arran Consul and Dunaverney gave the highest yields in the main-crop varieties; Majestic and Ally in the early main-crop varieties; British Queen (susceptible) and Great Scot in the second earlies; and Epicure (susceptible), Herald (under test for immunity), Sharpe's Express (susceptible), and America among the earlies.

In the district trials, of eight immunes tested, Arran Consul, Templar, Kerr's Pink, and Dunaverney gave a higher yield than the well-known variety Lochar which, though of inferior quality, is still grown extensively. Arran Consul produced a larger average yield than any other variety tested, and should prove very suitable for the export trade as the tubers are of good keeping and cooking quality and are not susceptible to blight.

As there is considerable liability to error in results obtained when varieties are tested in single plots, a further test was carried out in plots arranged on a modified checker-board system. Arran Consul and Glencoe (which is still under test for immunity) gave greater yields both of ware and total crop than either Up-to-Date or Lochar,

while Templar, giving a slightly smaller yield of ware, gave a higher total yield than Up-to-Date.

BLATTNÝ (C.). **Předběžná zpráva o ozařování svinutkových Bramborů radiovými paprsky β a γ.** [Preliminary report of the irradiation of Potatoes affected with leaf roll with β and γ radium rays.]—*Ochrana Rostlin*, vi, 3, pp. 48–53, 2 figs., 1926.

The purpose of the present preliminary investigation was to test the action of the β and γ radium rays on the growth of potato plants affected with leaf roll. Twenty-four tubers of the Schotsche Muis [Midlothian Early] variety, which for several years consecutively had exhibited symptoms of a severe form of leaf roll, were separately planted in pots, 12 of which were irradiated as soon as the first leaves appeared, and 12 served as controls. Of the 12 pots treated, 8 were subjected to irradiation from a glass tube containing 25 gm. of 'nasturan' [heavy uranite], and 4 to irradiation from a tube containing 50 gm. At first the treated plants appeared to be stimulated, but at the end of the second month they were stunted in comparison with the controls, and showed more pronounced symptoms of leaf roll than the latter. The final result showed that the plants irradiated died much earlier than the controls, and gave a smaller yield. In the author's opinion, these results indicate a stimulation by the rays of the vital processes of the plants, as shown by the earlier more vigorous growth and the fact that tests for the presence of starch in the leaves were positive about 7 to 10 days earlier in the case of irradiated plants than for the controls. This stimulation caused a premature ripening of the plants which would account for the earlier death of the plants and for the smaller yield of the tubers harvested.

ŘÍHA (J.). **Obranné prostředky proti obecné strupovitosti Bramborů.** [Control of common scab of Potatoes.]—*Ochrana Rostlin*, vi, 4, pp. 73–80, 1 pl., 1 fig., 1926.

Common scab of potatoes said to be caused by twelve species of *Actinomyces* [a list of which is given: see also *R.A.M.*, vi, p. 179] is stated to be one of the most prevalent and economically important diseases of the crop in Czecho-Slovakia, particularly on farms where clover enters into the crop rotation, as the top dressings of lime applied to the latter tend to increase the alkalinity of the soil and favour the development of the scab organism. Experiments made in 1923 to test the effect of green manure, lime, and sulphur applications to the soil in the control of the disease, gave negative results. In 1924 a new series of experiments was made with formalin, sulphuric acid, phosphoric acid, calcium cyanamide and sulphur, of which the sulphuric acid in a 10 per cent. dilution, applied at the rate of 55 l. per 15 sq. m. gave the best results, the resulting crop showing 6·4 per cent. of scabbed tubers as against 97·45 per cent. in the control, and no injurious effect of the treatment on the plants being apparent. Sulphur and calcium cyanamide failed to give any control, while formalin was only partly effective at the highest concentration. The same preparations tested in 1925

gave inconclusive results, as that year scab did not occur in the experimental plots.

It is further stated that varietal resistance of the potato to common scab appears to depend on the locality, as some varieties listed by Wollenweber as resistant in Germany, were found to be susceptible under Czecho-Slovakian conditions.

SCHWARZ (M. BEATRICE). **De roestvlekkenziekte van Aardappelknollen in Nederlandsche Oost-Indië.** [The rusty spot disease of Potato tubers in the Dutch East Indies.]—*Tijdschr. over Plantenziekten*, xxxii, 12, pp. 321–330, 1 pl., 1926. [English summary.]

In this paper the author describes a disease of potatoes causing considerable damage in the Dutch East Indies. It was formerly known as 'sprain' (kringerigheid) but as the European disease under this name does not quite agree with the symptoms observed, the name 'rusty spot' has been adopted [see also *R.A.M.*, v, p. 572]. The plants remain quite normal in appearance and affected tubers cannot be distinguished externally from healthy ones, but when cut open a cracking sound is heard and the cut surface soon reddens by the tyrosinase reaction.

The disease is generally confined to the tissues within the vascular ring and appears as a central diffuse, rusty discoloration usually developing from the basal end, together with scattered rusty spots, while later two lateral discoloured zones appear along the vascular ring but these may be obscured by general spotting. The cell walls of the rusty spots are thickened and impregnated with a brown substance resembling suberin, and the affected tissues are surrounded by a cork cambium. Lack of lime in the soil and the use of stable manure appear to increase the percentage of disease. Infected tubers from Sumatra planted in Java, in a region where the disease does not occur, gave a healthy crop after one or two generations, whilst healthy stock from Java planted in a disease-infected area yielded rusty tubers.

A table is given comparing the symptoms of this disease with those of net necrosis and sprain with which it has many points in common [*R.A.M.*, vi, p. 179]. Sprain, however, differs from rusty spot in that the disease can, in some cases, be observed on the outside of the tuber, often developing from the point where secondary growth occurs; and in that the discoloration takes the form of rings instead of patches.

Net necrosis is distinguished from rusty spot by the occurrence of mosaic-like mottling of the leaves of the plant, by its attacking tubers of all sizes, by the fact that it spreads during storage (which does not occur with either sprain or rusty spot), and because it is not affected by the application of stable manure or lack of lime in the soil. Rusty spot is therefore considered to be distinct from these two diseases though probably belonging to the same group as sprain.

GARDNER (M. W.) & KENDRICK (J. B.). **Potatoes—a virus disease menace to Tomatoes.**—*Hoosier Hort.*, ix, 1, pp. 5–8, 1927.

The observations of Dickson [*R.A.M.*, v, p. 195] and Vanterpool

[ibid., v, p. 636] on streak or winter blight of tomatoes have been confirmed by the writers in Indiana where the disease may cause severe losses. The disease is due to the joint action of two viruses, one of which is that of ordinary tomato and tobacco mosaic while the other is obtained from potato plants which may either show symptoms of mosaic or be quite healthy in appearance. Tomato mosaic virus alone may retard growth and reduce yield but does not kill the plants nor ruin the crop. The potato virus alone does not seem to produce any injury in tomato plants, giving rise merely to a faintly visible mottling of the foliage. The very destructive streak symptoms develop when both viruses are inoculated together into healthy tomato plants or when either is inoculated into plants already affected by the other. A tomato plant affected by streak transmits the disease with all its symptoms to other tomato plants by means of the pruning knife and presumably by insects.

The ordinary mosaic is harboured in perennial weeds, such as ground cherry [*Physalis*], or may get into greenhouses from affected tomatoes or tobacco, in neighbouring fields or gardens, while the potato virus is harboured mainly in volunteer plants or occasionally by field tomatoes, tobacco, and certain weeds. Ordinary mosaic is liable to be brought into glasshouses in autumn by insects and is difficult to exclude but may be kept out by screening the seed-beds and crop, frequent fumigation, and by postponing seeding until frost has killed off outside sources of infection. The first plants to show symptoms of streak should be pulled up and destroyed, timely and frequent fumigation practised, and the pruning knife disinfected in formalin 1 part and water 1 part after use on each plant.

FOLSOM (D.), SCHULTZ (E. S.), & BONDE (R.). **Potato degeneration diseases: natural spread and effect upon yield.**—*Maine Agric. Exper. Stat. Bull.* 331, pp. 57–112, 1926.

Tests of the effects of degeneration diseases on the yield of potatoes were continued in 1924 and 1925 [*R.A.M.*, iv, p. 54]. Spindle-tuber reduced the yield of completely infected stocks of Green Mountains and Irish Cobblers in 1924 by 20 per cent., and Green Mountains in 1925 by 25 per cent. Mild mosaic caused a reduction of yield rate of 8 to 15 per cent. in 1924, and 25 per cent. in 1925. With rugose mosaic the reduction was as much as 50 per cent. in the first year, and 60 per cent. in the second. Mild mosaic in 1924 showed the same reduction in yield in the third year of infection as in the second. Inferior soil reduced the yield of healthy stock below that of a completely diseased stock on good soil, and increased the injurious effects of mild mosaic.

The amount and distance of spread of mosaic and spindle-tuber were also studied. It was found that in 1923 one or both diseases had spread so that one-third of the plants in the first five healthy rows next the diseased one were infected; while in some cases infections occurred as far as the fiftieth row. An increase of disease due to hill-to-hill spread in partly diseased stock, was shown to be more frequent and more effective than the spread from one field to another.

Although spindle-tuber seemed to increase as rapidly as mild mosaic when no tuber selection was attempted, the former was

easier to reduce by roguing tuber unit seed plots than the latter. The elimination of other degeneration diseases such as leaf roll and rugose mosaic was less difficult than that of mild mosaic.

Other insects besides aphids appear to transmit these diseases, since no correlation was found between the number of aphids and incidence of mosaic.

Incompleteness of tuber infection associated with a light natural inoculation and usually accompanied by a delayed appearance of symptoms, renders it difficult to rogue early. A comparison was also made of the percentage of disease and the tuber weight but the results were too variable to justify any attempt to reduce the disease by the selection of tubers on the basis of absolute weight. Contact between hills increased the spread of disease but was not necessary for this to occur. Spread was more marked in the southwestern than in the northeastern part of the State.

In conclusion the authors state that there can be no great degree of certainty in forecasting the outcome of a given method of roguing and consider that the probable value of seed tubers can best be ascertained by advance tests, under warm climatic conditions.

MacLeod (D. J.). **Report of Dominion Field Laboratory of Plant Pathology, Fredericton, N.B.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 42–51, 1926.

Experiments started in 1924 to ascertain the possibility of transmitting mild, rugose and leaf rolling mosaic, mottled and unmottled curly dwarf, leaf roll, and spindle-tuber of potato to plants produced from healthy eyes grafted into tubers known to be infected with these diseases, were continued in 1925. The results indicated that all these diseases may be transmitted by this method to the plants arising from the healthy eyes, a noteworthy feature in these experiments being that, with the exception of rugose mosaic and mottled curly dwarf, in no instance did the symptoms appear until the second generation.

The results of comparative tests on the efficacy of various concentrations of Bordeaux mixture and of Bordeaux dusts for the control of late blight [*Phytophthora infestans*] and early blight [*Alternaria solani*] of potato, showed by the condition of the foliage during the growing season and the yields at the harvest that better protection was afforded by the Bordeaux dust than by the Bordeaux spray applied with power machines.

Experiments carried out to establish whether the causal organism of potato blackleg [*Bacillus atrosepticus*] overwinters in the soil, indicated that, under New Brunswick conditions, this does not occur, or if it does, the organism is sufficiently attenuated to be harmless to the plants. In one series, however, the results appeared to show that the organism is capable of overwintering, in some measure, in the tissues of the surviving tubers.

Šeda (A.). **Stříkání natě Bramborů Bordeauxskou směsí.** [Spraying the foliage of Potatoes with Bordeaux mixture.]—*Ochrana Rostlin*, vi, 3, pp. 41–48, 3 figs., 1 graph, 1926.

The spraying experiments briefly reported in the present paper

were made in 1925 at two experiment stations in Czecho-Slovakia for the purpose of demonstrating to the local potato growers the control of late blight [*Phytophthora infestans*], which is stated to be very prevalent in the country. The varieties used in the experiments were Pirola and Tuno, and four sprayings of 1·5 per cent. Bordeaux mixture were given. The sprayed plants remained green about a month longer than the untreated which were heavily attacked by the fungus, and yielded from 21·3 to 88·4 per cent. more tubers (in weight) than the latter, with a corresponding increase in the number of sound tubers harvested. A detailed analysis is given of the cost of spraying under Czecho-Slovakian conditions, and the economic advantage of the treatment is stressed.

PARTRIDGE (G.). **Potato inspection and certification.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. Agric.*, pp. 13–17, 1926.

Public interest is stated to continue unabated in Canada in the production of certified seed potatoes. Of the 4,542 fields inspected, 1,235 failed to qualify for certification. Of this number, 607 fields, the majority of them planted with uncertified seed, were disqualified for the presence of mosaic.

The average percentages of diseases in the fields inspected in the different provinces were as follows: black leg [*Bacillus atrosepticus*] 0·17 to 1·25; leaf roll, 0 to 0·59; mosaic 0·14 to 5·7; and wilts [*Fusarium oxysporum* and *Verticillium albo-atrum*] 0 to 0·33; and in the fields passed 0·04 to 0·70; 0 to 0·38; 0·08 to 0·69, and 0 to 0·22, respectively.

The occurrence of misses in the fields, representing diseased plants which have been rogued out, will in future be taken into consideration and included in the standard for field inspection, except in cases where it can be definitely determined that they are attributable to purely mechanical causes. Attention is directed to the unsuitable storage conditions to which seed potatoes are occasionally subjected after certification and which impair the soundness and vitality of the seed.

JACZEWSKI (A. A.). Памятная книжка для записей данных фитопатологического осмотра Картофельных насаждений. [Note-book for entering data obtained from the phytopathological survey of Potato crops.]—Issued by the A. A. Jaczewski Mycological Laboratory, Leningrad, 1926.

This note-book has been compiled in view of the introduction of a system of seed certification of potatoes in Russia. In the introductory part, consisting of eleven pages, the author gives succinct descriptions of the potato diseases which occur in the country, of which the following deserve special mention: powdery mildew (*Erysiphe cichoraceurum*), yellow leaf spot caused by *Cercospora concors* Sacc., witches' brooms, and tuber ring rot (due to various causes). With the exception of the seed selection nurseries which should be kept continuously under observation, three inspections are believed to be sufficient, the first about the flowering time, the second two or three weeks later, and the last at harvest. In an appended table are given the maximum per-

centages of infection (virus diseases, 3; other leaf diseases, 3; all tuber diseases, 5) permissible in crops destined for the production of seed tubers.

PETRI (L.). **Alcune notizie sulla produzione di Patate da seme.** [Observations on the production of seed Potatoes.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 359–377, 9 pl., 1926.

In this paper, the author reviews briefly the seed potato industry in different European countries, and describes in detail the organization in operation in Germany where potato seed selection has been developed on a large scale with the object of preventing the spread of such diseases as scab (*Actinomyces scabies*), and wart disease (*Synchytrium endobioticum*), in addition to the general improvement of stock. The importance of seed potato selection has up till now been overlooked in Italy, but the occurrence of leaf roll, curly dwarf, and less frequently of mosaic, especially in the valley of Tanaro and in Tuscany, indicates the need for the establishment of a properly organized service to carry out such work, to encourage better methods of cultivation, and to test imported varieties under Italian conditions.

BRUNER (S. C.). **El problema de la libre importación de Papas.** [The problem of free importation of Potatoes.]—*Rev. de Agric., Comercio y Trabajo*, [Cuba], viii, 2, pp. 36–39, 4 figs., 1926.

In this paper the author gives a popular account of the wart disease of potatoes (*Chrysophlyctis endobiotica*) [*Synchytrium endobioticum*], which is said to be unknown in Cuba, and stresses the importance of the decrees issued in 1923 (No. 1850) and 1924 (No. 1260) prohibiting the importation of potatoes from certain regions.

ROSEN (H. R.). **The mosaic disease of Sweet Potatoes with special reference to its transmissibility.**—*Arkansas Agric. Exper. Stat. Bull.* 213, 16 pp., 1 col. pl., 3 figs., 1926.

In continuation of his investigation on the transmissibility of sweet potato mosaic [*R.A.M.*, v, p. 448], the writer now describes experiments in which over 20 per cent. of the treated plants were successfully inoculated with the disease by rubbing infected material on the leaves and also by injecting infected juice into the stem. No infection was obtained during one growing season, or in successive seasons when the fleshy roots were used for propagation after the lapse of the intervening winter seasons. Success was only gained by growing the inoculated plants continuously over a period of 12 to 13 months. The plants were inoculated in the growing season, cuttings from these were taken and grown in the greenhouse over the winter and transplanted to the field the following year. The disease develops slowly, becoming more severe until a certain maximum is reached. Frequently only a small proportion of the runners exhibit the symptoms of the disease on any one plant. The writer believes that the disease is not capable of being transferred to healthy plants under natural conditions in the northern sweet potato sections of the United States, while in

the southern parts there is said to be ample opportunity for transmission to occur.

LAURITZEN (J. I.). **A strain of Yellow Jersey Sweet Potato resistant to surface rot (Fusarium oxysporum W. & C.).**— *Journ. Agric. Res.*, xxxiii, 11, pp. 1091–1094, 1926.

The loss of sweet potatoes in storage caused by surface rot (*Fusarium oxysporum*) is often large [in the United States], especially in the case of the Jersey varieties.

While examining Yellow Jersey roots in storage in 1923 and 1924 the author observed that two distinct types were present, one of which was free from surface rot. Both of these strains have reproduced true to type each season since. Roots from selected stock compared with those from the unselected, after storing for five months, showed only 0·6 per cent. as against 38 per cent. infection. A more extensive experiment showed that the selected roots exhibit a marked resistance under a variety of conditions, even those particularly favourable to surface rot. The susceptible strain has a tendency to shrivel at the tip and around the lesions which does not occur to any extent with the resistant strain even under very dry conditions. It is proposed to call the new strain Improved Yellow Jersey.

PALO (M. A.). **Rhizoctonia disease of Rice. 1. A study of the disease and of the influence of certain conditions upon the viability of the sclerotial bodies of the causal fungus.**— *Philipp. Agric.*, xv, 6, pp. 361–375, 4 pl., 3 figs., 1926.

On the farm of the College of Agriculture at Los Baños in the Philippines the stems, outer leaf-sheaths, and leaves of seedling and maturing rice plants were subject to attack by a species of *Rhizoctonia* which may cause serious losses. On the leaves and leaf-sheaths elliptical or oblong spots are formed, which by coalescence may become irregular and which have greyish-green, bluish-grey, or straw-coloured centres and distinct brown borders. In severe attacks most of the outer leaves die and fall off and the parts of the plants above the infected regions turn yellow. A brownish, silky mycelium grows on the surface of the dead tissues and gives rise to sclerotia, at first white and finally brown, which after maturing fall to the ground. Infection may arise from the fungus in the soil or by contact of rice plants with other kinds of plants such as beans and various weeds; in the early morning during the rainy season the aerial mycelium of the fungus may bridge spaces 3 to 5 cm. wide. Dwarfing and complete sterility of the panicles may result from attack, as in the case of sclerotium disease [*Sclerotium oryzae*: *R.A.M.*, iv, p. 469], but the dry rot, shredding of the straw, and masses of white mycelium characteristic of the latter are not found.

The hyphae in pure cultures isolated from sclerotia on seedling rice, produce branches which are constricted at the base and with a septum a short distance above it; they arise either at an acute or at a right angle to the parent hypha and bend towards the direction of its growth. The individual cells vary from 20 to 248 μ in length and from 4 to 12 μ in width on different substrata. The sclerotia,

which are more or less flattened and irregular or occasionally spherical, consist when young of short, barrel-shaped cells, but the mature bodies show a pseudoparenchymatous internal structure. On various sterilized artificial and natural substrata the sclerotia are larger than those on the host, varying from 0·5 to 5·5 mm. in diameter.

Inoculations were carried out by placing sclerotia on the leaves, inserting them under the sheaths, and by putting them on the soil near the plants, which in every case were kept in damp chambers. All the plants were attacked with equal severity, water-soaked patches developing in two days and a heavy growth of aerial mycelium in four days; the plants subsequently fell over and died and sclerotia developed on the decaying parts. With this *Rhizoctonia* isolated from rice, inoculations were made on a number of vegetable and field crops, including seedlings of cotton, chilli pepper, cucumber, groundnut, onion, and squash, all of which damped off; the fungus also caused a stem-rot of sorghum, sugar-cane, and cassava, and a blight of avocado. The fungus, which is very similar to *R. solani* [*Corticium solani*] and evidently belongs to the same group, is an aggressive parasite under conditions of warm temperature and high humidity.

An experiment was conducted in order to ascertain the longevity of the sclerotia in soil maintained either air-dry or with a moisture content equivalent to 38 per cent. of its water-holding capacity. Sclerotia were placed on the soil or buried in it to a depth of 5, 10, and 20 cm., and a further lot was immersed in water. They were found to have lost the power to germinate after 2 to 3 months in water and after 4 to 5 months in moist soil, but those on the surface gave rise freely to secondary sclerotia which kept the fungus alive for an indefinite period. In dry soil, vitality was lost after 6 to 7 months, but those on the surface survived for 7 months.

To control the disease in seed-beds steam sterilization is recommended; in badly infected fields the plant debris should be burnt and the surface of the soil fired. After heavy rain the land should be ploughed to bury the sclerotia (which are then killed within 5 months), harrowed, and rolled. If the land can be flooded for three months all the sclerotia will be killed. As close planting promotes the disease, planting or drilling the seed is preferable to broadcasting.

STEVENS (H. P.). **Unsmoked sheet Rubber prepared with dinitroorthocresol.**—*Bull. Rubber Growers' Assoc.*, viii, 10, pp. 536–537, 1926.

Preliminary experiments on the prevention of moulds in unsmoked sheet rubber by the use of dinitroorthocresol indicate that this substance is at least as efficient as paranitrophenol [*R.A.M.*, v, p. 385] for this purpose. It appears to have no detrimental effect on rubber, but cannot be definitely recommended for use until further tests have been carried out.

STEVENS (H. P.). **Smoked sheet Rubber prepared with dinitroorthocresol.**—*Bull. Rubber Growers' Assoc.*, viii, 11, pp. 594–596, 1926.

The author records further experiments on the use of dinitro-

orthocresol for the prevention of moulds on rubber. Tests with smoked sheets gave equally efficient control as in the case of unsmoked sheet rubber already reported [see preceding abstract].

ASHPLANT (H.). **Report for November, 1926. Stripe canker experiments.**—*Planters' Chron.*, xxii, 5, pp. 57–62, 1927.

This paper gives the results of experiments carried out at the Mooply and Tenonalai Stations, S. India, to test the efficiency of the most promising of the newer disinfectants on the control of stripe canker of rubber [*Phytophthora* sp.]. The substances tested were cargilineum mixtures, A and B containing 5 and 10 per cent. of disinfectant, respectively; paranitrophenol and China clay (1·0 or 1·4 per cent. and 10 per cent., respectively) and paranitrophenol paste (2·5 per cent. plus China clay and casein 2 per cent., the whole being beaten up into a paste), while for the control plot brunolinum hybol plus 20 per cent. China clay was used.

Each block comprised 300 trees and disinfection was carried out by the tappers either immediately after collecting the latex or in the case of cargilineum when the cuts were dry.

Great difficulty was experienced in applying the disinfectant regularly during the monsoon and in many cases after application the disinfectants became too diluted to be effective, with the result that some infection, often only very slight, occurred in every case. Provided that the tapping cut is continuously damp the fungus parasite is said to be able to establish itself in 36 hours after alighting on the cut, and in much less time to penetrate beyond the range of weak disinfectants. The results which are given in tabular form show that the paranitrophenol compounds were in no way superior to the brunolinum and cost almost twice as much.

The cargilineum mixtures gave poor results when applied once after every three tappings, but cargilineum B proved exceedingly effective when applied after alternate tappings, only about 3 per cent. developing into severe attacks. Brunolinum hybol gave good results, showing only 6 per cent of cases after two months.

Both cargilineum A and B have a greasy consistency and are not miscible with water. They dry slowly and though penetration was deep no damage was recorded. Where difficulty is experienced in securing the disinfection of the cuts immediately after tapping, cargilineum B applied at least twice weekly is advised. The cost of the latter is quoted at Rs. 37·5 per 100 lb.

[In section (b) of the paper by Steinmann & Deuss [*R.A.M.*, v, p. 631] disinfectants miscible with water are discussed as well as non-miscible ones. Agrisol and izal are stated in error to belong to the latter group whilst they are, of course, well known to belong to the former.]

BLATTNÝ (C). **Choroby, ohrožující v cizině Chmel.** [Diseases threatening the cultivation of Hops abroad.]—*Ochrana Rostlin*, vi, 1–2, pp. 15–29, 8 figs.; 3, pp. 53–55, 1926.

The present paper is an account, for the most part compiled from the observations of Salmon, of the downy mildew (*Pseudoperonospora humuli*) [*R.A.M.*, v, p. 639; vi, p. 119] and mosaic disease of hops. The statement is made that up to now there is no

authoritative record of their presence in Czecho-Slovakia, as the reported outbreak of downy mildew in the country could not be confirmed. Referring to the suspected occurrence of nettlehead of hops in Czecho-Slovakia [ibid., v, p. 126], the author states that the disease in question is a purely physiological disturbance in no way connected with a virus disease. Strict quarantine measures are advocated for the prevention of the introduction of diseases into the country.

ROSENFELD (A. H.). **The Sugar industry of Peru.**—*Tropical Plant Res. Foundation, Sci. Contributions*, vi, 27 pp., 11 figs., 1 map, 1926.

In giving a cursory review of the methods of cultivation of the sugar-cane adopted in Peru, the author (who is Technical Adviser to the American Sugar-cane League) states that the crop is remarkably free from disease in that country. Careful surveys of all the valleys where sugar-cane is grown, failed to reveal either mosaic or gummosis (*Bacterium vascularum*), nor could any cases be found of the common leaf spots caused by *Helminthosporium* [*sacchari*] and *Leptosphaeria* [*sacchari*].

[This paper has also appeared in *Facts about Sugar*, xxi, 50–52, 1926, and *Intern. Sugar Journ.*, xxviii, 335, pp. 590–597, 3 figs., 1926.]

DEARNESS (J.). **An annotated list of anthracnoses in the open and under glass in Canada and the adjoining United States.**—*Dominion Dept. Agric. Div. Bot. Bull.* 71, Appendix I, pp. 62–76, 1926.

In this appendix to the quinquennial report for 1920–4 on the prevalence of plant disease in Canada there are listed 162 species of *Gloeosporium*, 43 species of *Colletotrichum*, 35 species of *Marssonia* [*Marssonina*], 21 species of *Septogloeum*, and 82 species of *Cylindrosporium*, together with the mean spore measurements of each species and a host index.

BISBY (G. R.), CONNERS (I. L.), & BAILEY (D. L.). **The parasitic fungi found in Manitoba.**—*Dominion Dept. Agric. Div. Bot. Bull.* 71, Appendix II, pp. 77–83, 1926.

This list includes the fungi and bacteria found to be parasitic upon wild and cultivated hosts in Manitoba during the five-year period 1920–4. Some fungi parasitic on fungi and insects are also recorded. The 520 records upon 281 hosts comprise 14 bacteria, 21 phycomycetes, 43 ascomycetes, 143 fungi imperfecti, 25 smuts, 104 rusts, and 6 other basidiomycetes—a total of 356 species of parasites arranged under the respective hosts.

PETCH (T.). **Studies in entomogenous fungi. X. Verticillium spp.**—*Trans. Brit. Mycol. Soc.* xi, 3–4, pp. 251–254, 1 fig., 1926.

The species of *Verticillium* generally known as the cinnamon fungus, which occurs on *Aleyrodes citri* and other scale insects on citrus in Florida and the West Indies, was referred by Fawcett (Fungi parasitic upon *Aleyrodes citri*, 1905) to *V. heterocladum*

Penz. This determination the author considers to be incorrect. A striking character of the fungus is its production of superficial stromata. Penzig makes no mention of a stroma in his fungus, and in particular he stresses the fact that the conidia are borne at the tips of the phialides singly or in threes. He figures three conidia at one tip each borne on its own sterigma, and compares his fungus with the genus *Cladobotryum* Corda. Apart from these differences, however, the description might well be taken to fit the Florida species.

Fron's determination of *V. heterocladum* in France (*Bull. Soc. Myc. France*, xxvii, p. 486, 1911) appears to the author, from the account given of it, to be a *Cephalosporium* (or *Acrostalagmus*).

The author was unable to examine European specimens of *V. heterocladum* and therefore a correct name for the cinnamon fungus is not given.

Quarantine on account of the White Pine blister rust. Notice of quarantine No. 63, with regulations.—*U.S. Dept. of Agric. Fed. Hort. Board, Service and Regulatory Announcements July–September, 1926*, pp. 82–98, 1926.

This new quarantine measure, involving the whole of the United States, on account of the white pine blister rust (*Cronartium ribicola*) came into force on 1st October, 1926, when it superseded the Federal plant quarantines Nos. 26 and 54.

It prohibits the movement of five-leafed pines (*Pinus* spp.) from the eastern half of the United States to the western half, the dividing line of which is the western boundary of Minnesota, Iowa, Missouri, Arkansas, and Louisiana, and from the following areas into any state outside such areas: (1) the New England States; (2) New York State; (3) Minnesota and Wisconsin [except to areas (1) and (2)]; (4) Michigan, New Jersey, and Pennsylvania [except to areas (1), (2), and (3)]; (5) Washington; (6) certain counties of Oregon.

The interstate movement of black currants is prohibited except within the area comprising the States of Alabama, Arkansas, Florida, Kansas, Louisiana, Mississippi, Nebraska, N. Dakota, Oklahoma, S. Dakota, and Texas. No currant (other than black, red, and white varieties and mountain currants) or wild gooseberry plants are permitted to be moved from an infected state to any other state. The states now known to be infected are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.

Inspection and certification is required for the inter-state movement of five-leafed pines, and currant and gooseberry plants from any state not infected, and full instructions with regard to certificates, permits, and marking requirements of plants permitted to be transported are set forth in detail.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

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DOIDGE (ETHEL M.). **A preliminary study of the South African rust fungi.**—*Bothalia*, ii, 1a, pp. 1–228, 6 col. pl., 212 figs., 1926.

This valuable monograph brings up to date an account of the collections of South African rusts which have been accumulating at the National Herbarium since the issues of the respective volumes of Sydow's 'Monographia Uredinearum', a work which considered the earlier South African collections. With a very few exceptions the biology of the South African rusts has not been investigated, so that the author has had no choice but to follow Sydow's classification. Easy reference is ensured by a combined fungus and host index at the end of the volume.

Of the 360 species described, 69 are held to be new. All the Latin diagnoses of these species are given together on pp. 199 to 213—an interesting innovation. There are 133 species of *Puccinia*, 88 held to be confined to South Africa, and 71 species of *Uromyces* (44 South African). There are 72 unplaced species of *Aecidium*. *Puccinia tristachyae* sp. nov. is the only indigenous grass rust whose life history has been established by experiment; the aecidia occur on *Vigna angustifolia*, and the uredo- and teleuto-sori on *Tristachya rehmanni*. *Puccinia maydis* Bereng. is the only South African rust now recorded on maize; the old record of *P. purpurea* on this host is indeed this species, but the host plant is apparently not maize. The *Puccinia* on cultivated geranium (*Pelargonium zonale*) is named *P. pelargonii zonalis*. It differs from the older species *P. granularis* Kalch. & Cke (*P. pelargonii* Syd., and perhaps *P. morrisoni* McAlp.) in lacking an aecidium stage, and in the uredospores being frequently ovate and with thinner walls. Of the seven species of *Hemileia* listed, *H.*

vastatrix, which caused the ruin of the coffee planting industry in Ceylon, is a native of Central Africa, and is considered to have spread from there by the transport of living plants. *H. woodii* on *Vangueria* is another species; attempts to cross-inoculate with *H. vastatrix* or *H. woodii* were unsuccessful. Twenty-one species of *Ravenalia* are recorded, of which twenty occur on Leguminous plants. The majority are endemic.

The numerous text figures will render the task of identifying these fungi a much easier one. The citations given under each species are supplemented with a bibliography of 43 titles referring to the more general works which have treated of South African fungi.

MARCHAL (É.) & VERPLANCKE (G.). **Champignons parasites nouveaux pour la flore Belge observés de 1919 à 1925.** [Parasitic fungi new to the Belgian flora observed from 1919 to 1925.]—*Bull. Soc. Roy. Bot. de Belg.*, lix (N.S. ix), 1, pp. 19–25, 5 figs., 1926.

In this annotated list of fungi recorded in Belgium [*R.A.M.*, i, p. 62] from 1919 to 1925, the following are of particular interest.

Phytophthora syringae occurs on *Syringa vulgaris*, generally in the oospore form, except in Wettern where the conidial form has also been observed. *Peronospora* [*Pseudoperonospora*] *humuli* on hops (*Humulus lupulus*) appears to have existed in the country since 1924 and was probably introduced from England on new hop varieties. *Didymella lycopersici* is of frequent occurrence on tomato, especially in the northern regions; it was probably imported from Holland where the disease is widespread. *Trametes pini* has been found on *Picea excelsa* in the pinewoods of Hertogenwald, producing red rot of the wood. The species of *Phoma* recorded on flax by Pethybridge in 1921 [*R.A.M.*, i, p. 175] is named *P. linicola*; it occurred on flax at Gembloux and Chaumont Gistoux, causing severe rotting at the base of the stem resulting in the speedy death of the young plants; the pycnidia measure 110 to 180 μ in diameter, and the elliptical conidia 8·5 to 13 by 4·3 to 8·5 μ. *Septoria azaleae*, which covers the leaves with minute brown spots, causes serious damage to azaleas; it was first seen at Meirelbeke in 1925, but is apparently prevalent in the Ghent region [*R.A.M.*, v, p. 613]. A species of *Colletotrichum* on *Aspidistra*, identified as *C. omnivorum* in spite of a slight difference in the size of the conidia [*R.A.M.*, v, p. 670], is recorded as only weakly pathogenic. *Cercospora concors* is reported on potatoes, so far only from Erenbodegen though it probably occurs elsewhere. *C. rhododendri* n. sp. was found on living leaves of *Rhododendron ponticum* where it formed black irregular spots, chiefly on the under surface of the leaves; the conidiophores are fasciculate, brown, 21 to 38 by 3·2 μ, and the conidia fusoid, irregularly curved, 3 to 7 septate, and 34 to 47 by 1·7 to 3 μ. *Graphium ulmi* was constantly found in the wood of species of *Ulmus* attacked by the die-back disease [*R.A.M.*, ii, p. 93]. *Fusarium dianthi* attacked carnations at Anvers and *F. vasinfectum* occurred on *Lupinus polyphyllus*, *Pisum sativum*, *Vicia faba*, and *Cucurbita pepo* at Gembloux.

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Hongos parásitos y saprofitos de la República Dominicana (6ª Serie).** [Parasitic and saprophytic fungi of the Dominican Republic (6th Series).]—*Bol. R. Soc. Española Hist. Nat.*, xxvi, 6, pp. 330–341, 11 figs., 1926.

The following species are recorded on cultural hosts in this number of the authors' studies on fungi of the Dominican Republic [*R.A.M.*, v, pp. 519, 583]. *Placosphaeria bougainvilleae* sp. nov. causes reddish-yellow spots on the leaves of *Bougainvillea spectabilis*; the stromata are about 200 μ long, and somewhat loculate; the sub-ellipsoid conidia (up to 6 by 2 μ) are borne on conidiophores twice their length. *Sphaerella pittospori* Cke is parasitic on the leaves of cultivated *Pittosporum tobira*, and is accompanied by *Gloeosporium pittospori* sp. nov. *Polystigma pusillum* Syd. has occurred on a second species of *Andira*, namely, *A. excelsa*. *Cercospora domingensis* sp. nov. on *Calotropis procera* is thought to differ from the other species of *Cercospora* described on *Calotropis* spp., and *C. demetriona* Wint. f. *minor* Frag. and Cif. is described on a *Crotalaria*.

[These papers are also being published in the form of bulletins of the Estación Agronómica de Haina, (Dominican Republic) Series B. —Botanica.]

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Hongos parásitos y saprofitos de la República Dominicana (7ª Serie).** [Parasitic and saprophytic fungi of the Dominican Republic (7th Series).]—*Bol. R. Soc. Española Hist. Nat.*, xxvi, 9, pp. 470–480, 13 figs., 1926.

The following species are included in this part of the authors' series of papers on Dominican fungi [see preceding abstract].

Uromyces clignyi occurred on living leaves of Sudan grass (*Andropogon sorghum* var. *sudanensis*) in the uredo stage only, which agreed with that of the fungus described by Patouillard and Hariot as occurring on *Andropogon* sp., *A. multinervium* from Central Africa and *A. hirtiflorum*, *A. lietmannii*, and *A. schottii* from California and Mexico. *Leptosphaeria theobromicola* n. sp. ad interim was found in the spots caused by *Septoria theobromicola* on the living leaves of *Theobroma cacao*, and is characterized by hypophyllous, globular, black perithecia, 90 to 125 μ in diameter, subclavate to oblong asci, measuring 45 to 60 by 12 to 14 μ, filiform paraphyses and cylindrical, 1-guttulate, 1- to 3-septate, hyaline ascospores (later yellowish), measuring 30 to 38 by 5 to 6 μ. *Septoria theobromicola* n. sp. was discovered on living leaves of cacao, associated with the preceding species, and is characterized by large, irregular, shrivelled spots near the margin of the leaf (white on the upper surface and with a reddish-brown border on the under surface), and by abundant cylindrical or sub-clavate continuous spores measuring 15 to 18 by 2 to 2·5 μ.

GÄUMANN (E.). **Mykologische Mitteilungen III.** [Mycological communications III.]—*Ann. Mycol.*, xxv, 1–2, pp. 167–177, 1927.

From his study of *Epichloë bambusae* Pat. which occurs on

bamboos throughout the Dutch E. Indies and is common about Buitenzorg on *Gigantochloa apus*, the author states that no morphological characters have been noted separating the races of *Epichloë* on other species of bamboo from this species. The fungus differs from the European *E. typhina* in forming only perithecia on the stromata, which develop most strongly on *G. apus* and most weakly on *Bambusa blumeana*. The cytology of the development of its perithecia is described.

A study of the living material of the type species of *Woroninella*, *W. psophocarpi* Racib., found on the leaves, stems, flower buds, and young pods of *Psophocarpus tetragonolobus* showed that Raciborski wrongly described the zoospores as having two flagella; they have only one. The author considers the species now referred to *Woroninella* as species of *Synchytrium* (*Eu-synchytrium*) which only form summer-sori. He accordingly transfers the above species, together with *W. dolichi* and a number of other species, material of which he has studied, to the genus *Synchytrium* as *S. psophocarpi*, *S. dolichi*, and so on. From infection experiments on various hosts, he concludes that these parasites are specialized at least to the genus of the host plant.

Four years' study of *Septobasidium bogoriense* Pat. have convinced the author that this fungus only grows with difficulty on plants not infested with aphids, but the wide range of plants attacked shows how weakly specialized is this fungus to its hosts.

Jaczewski (A. A.). Карманный определитель грибов. Выпуск первый. Голосумчатые. [Pocket key for the determination of fungi. Part first. Exoascales.]—Published by the A. A. Jaczewski Mycological Laboratory, State Institute of Experimental Agriculture, Leningrad, 88 pp., 48 figs., 1926.

The present handbook, the first issue of a series of systematic keys for the determination of fungi, contains a monograph of the Exoascales, using the term in the broadest sense. The author includes species from all parts of the world but particularly those from the tropics, as he considers these the most likely to gain entrance to Russia. He accepts Sadebeck's later classification (Tagbl. 66, *Versamml. Deutscher Naturforsch & Aerzte in Wien*, 1894), according to which the genus *Exoascus*, characterized by a perennial mycelium, is separated from the genus *Taphrina*, the mycelium of which is annual.

Brief descriptions are given of the 47 species of *Exoascus*, 53 species of *Taphrina*, and single species of *Entomospora* and *Ascocorticium* included in this work, together with the synonyms, the names of the hosts, and the geographical distribution of the fungi. The booklet terminates with a host index, an alphabetical list of the fungi described, and a bibliography of 178 titles.

Goldstein (Bessie). **A cytological study of the leaves and growing points of healthy and mosaic diseased Tobacco plants.**—*Bull. Torrey Bot. Club*, liii, pp. 499–599, 12 pl., 4 figs., 1926.

The writer has extended her investigations on the mosaic disease of tobacco [*R.A.M.*, iv, p. 47] by an intensive study of the behaviour of one variety—Connecticut Broadleaf—towards one

strain of the virus and by an attempt to correlate the histogenic development of the leaves with the succession of symptoms and the contents of the cells. The account of this work is preceded by a brief review of the literature of mosaic and similar diseases of plants.

When young, actively growing plants (a foot or more in height) of the variety mentioned are inoculated with virus in one of the well developed leaves, the patterns appearing on the younger existing leaves and on those which develop later may be separated, in order of succession, into the following six types: 1, dark, vaguely blotched; 2a, pale, crinkled; 2b, pale, vaguely blotched; 3, narrow nervisequum; 4, malformed, broad nervisequum; 5, pale, definitely blotched; and 6, irregular, narrow nervisequum.

Type 1 develops on leaves between the inoculated leaf and the first leaf to show decided symptoms, which is called the 'critical leaf'. Type 2a, and by further growth of the leaf, type 2b, characterize the pattern on the critical leaf and those above and nearest to it. Still younger leaves develop the pattern type 3. The leaves which are present as primordia during the initial stages of the disease develop type 4 while those which appear later show types 5 and 6, but types 4 and 5 may be present on the same leaf. In younger plants the types 1 and 2 are usually entirely absent.

Six stages in the histogenic development of the healthy leaf can be distinguished, but this development is arrested in every case by the entrance of the virus; the lighter green areas of the leaf patterns are invaded before the darker areas. There is a correlation between anatomical structure and leaf pattern and a correlation between the pattern and the stage of development of the leaf when the plant was inoculated. Patterns 1 and 2 which occur on leaves in late stages of histogenic development are due to the effects of the disease on the cell contents. In patterns 3 and 4 certain dark green areas escape early infection and continue histogenic development to a late stage.

A detailed account is given of the structure of the tissues and the cell forms and cell inclusions present in all the pattern types. The cells in the light green areas show enlarged nuclei, reduction in the number of plastids, and invariably the presence of X bodies and striated bodies.

In the final section of the paper a description is given of the appearance of the X bodies in fixed and stained material. In the stems they are regularly found in the leaf primordia just behind the growing point but have been observed only once in the meristematic layers of the growing point itself; they are present in the epidermis, in several layers of collenchyma cells below it, and reappear in the phloem tubes and the parenchyma cells of phloem and xylem but not in the vessels nor the central pith cells. In the roots both X bodies and striated bodies were found in the dead epidermal and collapsed cells, in the cells of the cortical parenchyma, and in the vein tissue within that region. They were detected in the cells of the floral envelopes but could not be seen in flower primordia and flower buds owing to the abundance of tannin globules and vesicles. The literature cited comprises some 109 titles.

MOORE (ENID S.). **Wilt in Turkish Tobacco.**—*Farming in South Africa*, i, 10, p. 380, 1 fig., 1927.

Tobacco wilt [*Fusarium oxysporum* var. *nicotianae*: *R.A.M.*, vi, p. 129], known to occur in the United States and in certain districts of South Africa, became very pronounced in 1925–6 in the Transvaal and the Cape Province, and is recognized as becoming more prevalent. Affected plants show a browning of the leaves in speckles and streaks, followed by shrivelling and withering; a stunting of the whole plant and the bending over to one side of the shoot tip. Frequently the disease affects only one side of the plant. Dark streaks occur on the stem and a corresponding discoloration of the wood is found internally. The causal organism lives in the soil and attacks the roots. As yet the disease is uncommon in South Africa, but once established, it will be difficult to eradicate. As control measures the following are recommended; pulling up and burning all diseased plants; avoidance of root injury; long rotations; and selection of disease-resistant varieties.

KÁŠ (V.). **Plisně—škůdci suchého Tabáku.** [Moulds that damage dry Tobacco.]—*Ochrana Rostlin*, vi, 3, pp. 55–58, 1 fig., 1926.

A brief description is given of the damage done to leaf tobacco stored under damp and poorly aerated conditions by various moulds, and some recommendations are made for the control of the trouble. In Czecho-Slovakia the moulds most frequently met with are *Aspergillus niger*, *A. flavus*, and different species of *Penicillium*, of which the first-named is considered to be the most dangerous.

ČEREPENNIKOV (N.). **Nová, dosud v Čechách neznámá choroba Rajských jablek.** [A new Tomato disease not before recorded in Czecho-Slovakia.]—*Ochrana Rostlin*, vi, 1–2, pp. 29–31, 1926.

In the present note the outbreak is recorded in one locality of Czecho-Slovakia of the leaf spot of tomato caused by *Septoria lycopersici*, a fungus which hitherto was not known to occur in the country. In giving a brief and popular account of the disease, stress is laid on the danger it presents to the cultivation of this crop, and the usual recommendations are made for its control.

BROWN (NELLIE A.). **A stem-end and center rot of Tomato caused by various unrelated organisms.**—*Journ. Agric. Res.*, xxxiii, 11, pp. 1009–1024, 5 pl., 1926.

A stem-end and centre rot has caused heavy losses in consignments of green tomatoes grown in Texas and Nebraska during recent years.

The rot usually starts when the fruits are green, but is scarcely noticeable until they begin to turn colour, when it shows as small brown spots or a thin brown ring round the stem end, or the fruit may simply become a sickly colour. When cut open the placentae are found partly or entirely decayed, and the diseased portions become a hard brown or in riper fruit an almost black mass which can be separated intact from the surrounding tissues.

The work reported in this paper began with a yellow bacterial organism isolated from diseased tomatoes in Texas and Nebraska

in 1924, which was for more than a year considered to be the specific cause of the disease, but since then six species of bacteria and five different fungi have been successfully inoculated into green tomatoes with the production of stem-end and centre rots. These are *Bacterium malvacearum*, *Bact. marginale*, *Bact. tumefaciens*, *Bact. savastanoi*, *Bact. campestre* [*Pseudomonas campestris*], *Bact. virilividum*, *Cladosporium* sp., *Septoria gladioli*, *Verticillium* (two species unspecified), *Fusarium moniliforme* [*Gibberella moniliformis*], and *Alternaria* sp. as well as four others which gave positive results only after repeated trials. It is thought likely that there are many other bacteria and fungi capable of producing the disease given the right conditions for development. Green tomatoes are more frequently attacked than riper fruit owing to their lower acidity favouring the development of the organisms. The disease is most prevalent during seasons of hot weather and abundant rain, especially when this causes cracking of the fruit. The author considers that it is quite possible that blossom-end rot usually attributed to physiological causes is produced in the same way, and inoculation at the blossom end with the bacterium from Nebraska tomatoes suffering from stem-end rot showed an appearance not unlike that of typical blossom-end rot.

Preventive measures should include growing varieties which do not crack readily, fertilizing with well-seasoned manure in which the organisms are less active, cultivating the soil frequently, and spraying with Bordeaux mixture.

BRUSSOFF (A.). **Das Übergreifen des Micrococcus ulmi auf Rotbuchen und Kanadische Pappeln.** [Infection of Copper Beech and Canadian Poplar by *Micrococcus ulmi*.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxvi, 11–12, pp, 351–355, 1926.

In continuation of his work on *Micrococcus ulmi*, said to be the cause of the die-back disease of elm [*R.A.M.*, vi, p. 61] the writer records copper beech (*Fagus sylvatica*) and Canadian poplar (*Populus canadensis*) as new hosts for this organism in western Germany. The infected wood of beech and poplar shows the same gross and microscopic appearances as already described in the other hosts; the plugged vessels contain a reddish-brown substance in which masses of cocci and diplococci are embedded. The organism, which can also be found motile in the vessels, grows in elm-extract and shows the characteristic bluish-green iridescent colonies on meat-extract agar.

CHAPMAN (H. H.). **The use of fire in regeneration of certain types of forest in India.**—*Journ. of Forestry*, xxxv, pp. 92–94, 1927.

Referring to a published report of the beneficial effect of fire in the forests of *Pinus longifolia*, the writer makes a further contribution to the controversial subject of the value of fire in protecting *Pinus palustris* against the defoliating fungus, *Septoria pini* [*Cryptosporium acicolum*] in the southern United States. [*R.A.M.*, vi, p. 133]. Plots protected from fire are said to be seriously damaged by the disease.

LAUBERT (R.). **Beobachtungen und Bemerkungen über das seuchenhafte diesjährige 'Zweigspitzensterben' der Kiefern.** [Observations and remarks on this year's epidemic outbreak of withertip of Pines.]—*Illus. Landw. Zeit.*, xlvi, 43, pp. 543–544, 1 fig., 1926.

The present paper records an epidemic outbreak in 1926 of withertip caused by *Cenangium abietis* [see also *R.A.M.*, iv, p. 3] in a large plantation of pine trees [*Pinus sylvestris*] in the Mark [Germany]. The first symptoms appeared early in the spring, when numerous shoots of the preceding year's growth were found to be killed by the fungus, the infection occasionally extending into two-year-old and even older twigs. The disease was at its height in June and the first weeks of July, when the affected trees were conspicuous from afar by their brownish tinge due to the numberless dead needles still adhering to the branches. According to the author's observations, which generally agree with F. Schwartz's description (Die Erkrankung der Kiefern durch *Cenangium abietis*, Verlag G. Fischer, Jena, 1895), the infection usually starts from the apical portion of the twigs, gradually working backwards. The dead wood bore on its surface the typical fructifications of the fungus, the mycelium of which penetrated deep into the wood; the latter assumed a dark discoloration sharply delimited from the healthy tissue.

Cenangium abietis is considered by the author to be a facultative parasite, its attack in 1926 on the pines having probably been favoured by weather conditions which weakened the resistance of the hosts and favoured an abundant production of spores. The fungus is stated to have been found on different species of *Pinus*, but *P. nigra* var. *austriaca* appears to be the most susceptible.

MCCALLUM (A. W.). **Forest pathology.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 9–12, 1926.

Since the previous report [*R.A.M.*, v, p. 526] a survey made in Eastern Canada to determine the spread and incidence of the white pine blister rust [*Cronartium ribicola*] has established that the disease is widely distributed throughout the important pine-growing sections of Ontario with the exception of the Rainy River and Temagami districts. It was also found that the rust has been present in the Muskoka district and along the Ottawa river for from seven to ten years, which is longer than was thought to be the case. Stress is laid on the necessity of controlling the disease, in spite of the comparatively high cost, by the eradication of cultivated and wild species of *Ribes* in the vicinity of white pine. Much circumstantial evidence has been collected indicating that the present widespread occurrence of the rust in British Columbia can only be accounted for by long-distance spore dispersal from pines. Of the pines occurring in this province, *Pinus monticola* has proved to be very susceptible; *P. flexilis* and *P. albicaulis* have not so far been found infected, with the exception of one specimen of the last-named in the arboretum at Point Grey.

Besides the two decays of *Abies balsamea* already described [*Stereum sanguinolentum* and *Poria subacida*; loc. cit.], a new investigation showed that in the Metis Lake area a third type of rot caused by *Polyporus balsameus* is of fairly common occurrence.

MOUNCE (IRENE). **Cultural studies of wood-destroying fungi.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 12–13, 1926.

A preliminary investigation was undertaken to determine whether the defect, commonly called 'dote' in English factories, in Sitka spruce (*Picea sitchensis*) used for the manufacture of aeroplanes, is present in the Canadian timber before it is shipped. A large number of cultures of different fungi were collected from specimens from freshly felled logs, from freshly cut green timber, and from wood which had been rejected as unfit for aeroplane material. The fungi are being identified and work is being done to determine whether any of them are responsible for the trouble.

Silver leaf (*Stereum purpureum*) is stated to have become very common in the Okanagan district of British Columbia on apples, apricots, and fruit trees generally, with the interesting feature that many of the affected trees are reported to recover. It also occurs, although with less prevalence,in Nova Scotia.

Further cultural studies of *Fomes pinicola* [*R.A.M.*, iv, p. 527] and of *Pholiota adiposa* have shown that both organisms are heterothallic and in all probability bisexual, as the compound mycelia formed by the union of two sterile, or imperfectly fruiting, monosporous mycelia produce normal sporophores, and monosporous mycelia isolated from the spores of fruit bodies from different localities are mutually fertile.

A list is given of the cultures of wood-destroying fungi which are included in the mycological collection at Ottawa.

TIMS (E. C.). **The influence of soil temperature and soil moisture on the development of yellows in Cabbage seedlings.**—*Journ. Agric. Res.*, xxxiii, 10, pp. 971–992, 2 figs., 9 graphs, 1926.

In this study on the effect of environmental factors on the resistance of cabbage to yellows (*Fusarium conglutinans*) [*R.A.M.*, v, pp. 458, 459] it was found that young seedlings (up to 20 days old) of Wisconsin All Seasons (resistant) and commercial All Seasons (susceptible) were almost equally susceptible to attack. Conditions of low soil moisture and a soil temperature of 27° to 33° C. induced a high percentage of disease in resistant forms; from 18° to 21° the amount was slight, and at 15° the disease was absent altogether. Cabbage plants of both resistant and susceptible strains exposed previously to a soil temperature of 12° to 16° before transplantation to contaminated soil at 27° proved more susceptible than plants previously grown at 25° to 28°.

Air temperature was found to affect yellows development independently of soil temperature. At a soil temperature of 27° the disease developed most rapidly on both Wisconsin Hollander (resistant) and Commercial Hollander (susceptible) in the greenhouse chamber kept at 25° and more slowly when the air temperatures

were 19° and 14·5°, but the final percentage of disease was about equal in each case. Similarly at a soil temperature of 21° a more rapid development took place in the 25° chamber than in the two other cooler ones. Commercial Hollander plants grown in infected soil at 21° and air temperatures of 14° and 28°, respectively, developed the disease much more rapidly and more virulently at an air temperature of 28° than at 14°.

A study of field conditions and greenhouse experiments showed that the quantity of rainfall affects the amount of disease independently of soil temperature relations. In the summer of 1922 the soil temperature at Racine, Wisconsin, averaged somewhat lower than in 1923, but the total rainfall was considerably less in the former year, and the average percentage of disease was markedly higher.

MOLZ (E.). **Die Mosaikkrankheit der Zuckerrüben, eine in Deutschland neue und gefährliche Zuckerrübenkrankheit.** [Sugar Beet mosaic, a dangerous new disease of Sugar Beet in Germany.]—*Deutsche Landw. Presse*, liii, 40, p. 501, 3 figs., 1926.

What is claimed to be the first known occurrence of mosaic of sugar beets in Germany was recorded by the author in 1926 in the district of Saale, Saxony. The disease was fairly widespread in a number of fields, a totally mosaic diseased field of mangolds being apparently the centre of infection. The symptoms consisted of irregular, effuse, pale green spots on the leaves, usually located in close proximity to the veins, and better visible by transmitted light. The normal green islands of healthy parenchyma between the spots for the most part stood out rather prominently on either side of the leaf, this giving the latter a wrinkled appearance. The leaf margins were frequently curled, and occasionally small cracks were found in the leaf cuticle caused by the irregular tension in the quickly growing leaves. The symptoms were first noticed immediately after the first thinning of the fields, and it is believed that infection was spread by the hands of the cultivators, the more so since aphids and other leaf-feeding insects were totally absent from the fields during the whole growing season.

In order to ascertain the bearing of the lime content in the soil on the disease, samples of soil were taken in heavily infected and disease-free spots of the same field. The former showed the presence of 0·35 and the latter of 0·47 per cent. lime, respectively, and the author therefore considers that applications of lime, or of a mixture of Thomas meal and kainit might control the disease.

It is estimated that the present outbreak reduced the yield in the infected fields by about 40 per cent.

MURPHY (P. A.) & M'KAY (R.). **Some new facts concerning Onion mildew.**—*Journ. Dept. Lands and Agric. Ireland*, xxvi, 2, pp. 115–123, 6 pl., 1926.

In this paper, the authors describe in popular terms the results of their investigations on the onion mildew (*Peronospora schleideni*) an account of which has already been given in this *Review* from another source [*R.A.M.*, vi, p. 138].

WALKER (J. C.). **Botrytis neck rots of Onions.**—*Journ. Agric. Res.*, xxxiii, 10, pp. 893–928, 6 figs., 1926.

The author describes in this paper the symptoms, morphology, and pathogenicity of three closely related but distinct diseases of onion bulbs, namely, grey mould neck rot caused by *Botrytis allii* [*R.A.M.*, iv, p. 519] mycelial neck rot, caused by *B. byssoidea* [ibid., v, p. 273], and small sclerotial rot due to *B. squamosa* [loc. cit.]. These names are descriptive of the respective diseases. Except for minor differences, e.g., spore size, the three species are similar morphologically, but they are readily distinguished by their characteristic growth on potato-dextrose agar. Studies on the overwintering of the organisms showed that in each case the sclerotia persist from year to year in soil or on refuse, and through the growing season the mycelium arising from the sclerotia lives saprophytically on organic matter. Finally spores from this mycelium cause the bulb infection at the end of the growing season.

All three species grow on potato-dextrose agar over a range of 3° to 33° C., with greatest development between 20° and 25°. Spore germination occurs over a range of 3° to 27°, but most promptly between 19° and 27°. Infection and decay of the bulbs are favoured by temperatures between 15° and 20°. Field observations over a period of years tend to show that *B. byssoidea* at least occurs mostly when the temperature is below and the rainfall above normal. Similar studies show that with *B. allii* and *B. byssoidea* infection takes place more readily when the neck tissue is succulent than when it becomes desiccated. The removal of the tops at harvest permitted infection by *B. allii* to take place freely whilst the desiccated neck tissue proved an effective barrier against invasion.

Coloured varieties of onion bulbs are, in general, shown to be less susceptible to attack by the three organisms than the white varieties, but when infection does occur, the decay proceeds as rapidly in both types. It is suggested that the greater resistance of the coloured forms is due to the presence of a water-soluble toxin in the cells of the dry outer scales.

Control measures are not yet completely worked out, but the use of coloured varieties is recommended. Artificial curing of the bulbs after harvesting, so as to dry up the neck tissues as quickly as possible, is also stated to be effective in checking the disease [*R.A.M.*, iv, p. 583].

MOLZ (E.) & MÜLLER (K. R.). **Ueber ein starkes Auftreten des Rotzes der Speisezwiebeln.** [A heavy outbreak of rot of comestible Onions.]—*Deutsche Landw. Presse*, liii, 42, pp. 526–527, 3 figs., 1926.

The principal onion-growing districts of the province of Saxony are stated to have suffered very heavily in 1926, chiefly owing to the exceptionally wet weather which prevailed during that year, from a bacterial rot which attacked both the bulbs and the green parts of the plants, and occasionally destroyed whole fields of the crop. In the field affected plants were marked by the bending over or the stunted condition of the foliage and flower stalks. The outer scales of the bulbs assumed, either completely or in spots only, a water soaked appearance, while some were reduced to a

slimy consistency. Frequently the first-formed roots were either totally or partly rotted, but in most cases new roots were being formed. The disease attacked both onion seedlings and one-year-old plants, and was also destructive in stored onions. The rotted bulbs emitted a characteristic butyric acid smell, and the causal organism is believed to be a butyric acid forming bacterium, although it was not identified. Most of the attacked bulbs were secondarily infected with *Botrytis cana*.

The disease is stated to be of comparatively rare occurrence in Germany, becoming dangerous to the crop only in wet seasons. It can be controlled by cultural methods directed towards maintaining a good aeration of the soil, the use of disease-free seedlings, and the immediate destruction of all infected plants.

LINK (G. K. K.) & BAILEY (ALICE A.). **Fusaria causing bulb rot of Onions.**—*Journ. Agric. Res.*, xxxiii, 10, pp. 929–952, 7 figs., 1 graph, 1926.

This paper, a preliminary account of which has already been given [*R.A.M.*, v, p. 465], contains the results of an intensive study of the cultural characters and pathogenicity of a number of species of *Fusarium* causing a bulb rot of onions which occurs widely in the field in Colorado and other States, and is also an important factor in producing transit and storage losses. The causal organisms are wound parasites specialized to attack only species of *Allium*, of which red, yellow, and white varieties are equally susceptible. The disease symptoms agree closely with those described by Walker and Tims [*R.A.M.*, iv, p. 202]. Full descriptions of the pathogenic species, *Fusarium zonatum* (Sherb.) Wr. forms 1 and 2 and *F. cepa* are given [loc. cit.].

F. bulbigenum and *F. moniliforme* [*Gibberella moniliformis*] were found to be only sometimes pathogenic, while *F. oxysporum* and *F. vasinfectum* were not pathogenic.

DURIEZ. **Une maladie nouvelle de la Carotte.** [A new disease of Carrots.]—*Rev. Hort.*, xcviii, 11, pp. 276–277, 1926.

For several years past carrot growers in the east of France have complained of a disease which occasionally destroys whole plots of this crop. The plants are attacked as soon as they appear above ground. The leaves assume a reddish or purple colour; the roots continue to grow for a short time, but soon stop abruptly and fail to develop any further, although they do not exhibit any other traces of the disease. Microscopical examination of affected plants showed the presence in some secondary rootlets of the cysts of *Asterocystis radicis*, which is believed to be the cause of the trouble, although its pathogenicity was not proved by inoculation experiments. Infection appears to take place within a fortnight of the germination of the seedlings, the parasite being localized in the piliferous layer and the root hairs of the plants. The trouble might be controlled, in the author's opinion, by a five-year crop rotation, the cultivation being discontinued in the interval of any allied or susceptible plants, e. g. parsnip, radishes, celery, lettuce, or leek, and by soil disinfection with unslaked lime at the rate of 3,000 to 5,000 kg. per hectare. Good results were also obtained by the

author from the application of 'crude ammonia', which, besides ammonium sulphate, contains ferrocyanide and sulphocyanide of iron, and from 4 to 10 per cent. of nitrogen. This preparation should be applied at the rate of 10 to 15 kg. per 100 sq. m. three months before sowing, as it is very caustic when fresh.

LAURITZEN (J. I.). **The relation of black rot to the storage of Carrots.**—*Journ. Agric. Res.*, xxxiii, 11, pp. 1025–1041, 1 pl., 3 graphs, 1926.

Black rot of carrots due to *Alternaria radicina* causes considerable loss every year in the United States. In one case carrots which appeared in excellent condition at the time of storing showed 62 per cent. with black rot after storage at 0° to 2° C. for 185 days. Experiments have shown, however, that roots free from black rot and from contamination with the pathogen do not become infected when stored in a house not previously used for the storage of infected carrots. It appears, therefore, that the disease has its origin in the field.

Roots from plants whose foliage had been inoculated with a spore suspension of *A. radicina* showed heavy infection at the termination of the storage period, though none at harvest time. The disease on the foliage, however, has never been found to occur in nature, and it is thought probable that *A. radicina*, which is a vigorous saprophyte, lives in the soil especially where decaying carrot roots and foliage are present.

The fungus is capable of infecting roots through the uninjured skin, but such infection occurs very slowly and only penetrates a few cells deep. Fresh wounds are more readily infected than old ones, while rootlets may also permit the entry of the fungus. Roots wounded by inserting a nail into each ten times and then inoculated by dipping in a spore suspension of the fungus, showed 38 per cent. infection contrasted with 10 per cent. for unwounded roots. The common practice of cutting off the tops with a hoe before storage greatly favours the disease.

The optimum temperature for growth of the fungus in pure culture was found to be 28°; the maximum lies between 33·6° and 39° whilst there was a considerable growth at −0·5° in 37 days. The temperature range for infection of carrots extends from −0·6° to 34°; the optimum is about 28°. There is a rapid decrease in the enlargement of the lesions when the temperature is lowered below, and still more when it is raised above this optimum. Infection might have been obtained at temperatures below −0·6° but even this temperature is too low for the storage of carrots, the best temperature for which is from 0° to 2°.

Of the seventeen varieties tested, Danver's Half Long was found to be one of the most resistant, whilst Carter's Summer Favourite and Rouge à forcer Parisienne were both very susceptible.

MCRAE (W.) & SHAW (F. J. F.). **Report on experiments with Cajanus indicus (Rahar) for resistance to Fusarium vasinfectum (wilt disease).**—*Sci. Repts. Agric. Res. Inst. Pusa, 1925–26*, pp. 208–212, 1 graph, 1926.

Progress is reported in the investigation which aims at the

isolation of a race of 'rahar' [pigeon pea] (*Cajanus indicus*) resistant to wilt disease (*Fusarium vasinfectum*) [*R.A.M.*, v, pp. 212, 768]. Twenty-four selections of seed, 17 from one parent, and 7 from another, lettered A and B, respectively, were used in the trials. A line of a known susceptible variety was sown alternating with the lines of the selected seeds and between each row pieces of diseased stem, kept from the previous year were planted. In the A series, the percentage of deaths due to wilt was 9, while that in the susceptible variety was 66. In the B series 54 per cent. died from wilt, and 79 per cent. succumbed amongst the susceptible race alternating with them. These figures suggest that the A series of selections has resulted in the accumulation of a certain amount of resistance, but owing to a possible variation in the uniformity of infection in different parts of the field these results need to be checked by reversing the order of the sowing next season.

KROEMER (K.). **Bericht über die Herbsttagung des Unterausschusses für Rebenveredlung.** [Report on the autumn meeting of the sub-committee for Vine grafting.]—*Mitt. Deutsch. Landw. Gesellsch.*, xli, 42, p. 871, 1926.

The author states that the 'mauke' disease of the vine [? *Bacterium tumefaciens*: *R.A.M.*, iv, p. 525], characterized by canker-like swellings on the stocks, is spreading in the vineyards of the upper reaches of the river Moselle. Grafted vines appear more susceptible than ungrafted, though the latter also are finally killed. Investigations carried out under his direction have shown that the disease is of an infectious character, although the causal organism has not yet been isolated. It is therefore recommended that no cuttings from the diseased stocks should be used for grafting, and that special tools be used for pruning the infected vines, as there are indications that the disease is transmissible by means of knives, scissors, and the like.

PETRI (L.). **Effetti dell'anhidride solforosa sui tralci della Vite.** [Effects of sulphur dioxide on Vine branches.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 385–389, 3 figs., 1926.

An examination of vine branches received from Savona showed symptoms of leaf injury caused by sulphur dioxide fumes from factories situated in the neighbourhood, viz., marked contraction of the walls and cell contents, and swelling of the starch granules. Numerous black, raised pustules were also visible on the branches, confluent at certain points and in most cases with an underlying layer of cork. The action of the gas causes the death of the stomata and the necrosis of the tissues ensues. Larger spots were also observed on the branches, but these are apparently due to the death of the hair glands and to the subsequent necrosis of the underlying tissue. Molz has also recorded the occurrence of a similar condition in Germany, where in addition to small black pustules others may be distinguished which are larger and not raised, less numerous, and more concentrated at the nodes. The cork layer beneath the blackened tissue is common also in this form.

BAILEY (D. L.). **Report of the Dominion Rust Research Laboratory, Winnipeg, Man. (Co-operating with the Manitoba Agricultural College).**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 67–84, 1926.

In addition to investigations already noticed in this *Review* from other sources, the following work is referred to in this report.

Tests of rust resistant varieties of wheat carried out in 1925 showed that in that year the durums, as a group, were quite resistant to stem rust [*Puccinia graminis*]; the varieties Nodak, Iumillo Selection, Mindum, Acme, Monad, and Pentad were highly resistant, while Kubanka C. I. 1440 and C. I. 2094, and Arnautka C. I. 1493 were variable in resistance, two distinct types being present in each case. Of the common wheats, Marquis x Iumillo Minn. II–15–44 was found to be the most promising for resistance. The durums were also quite resistant to leaf rust [*P. triticina*], while there appeared to be considerable variability in resistance among the common wheats.

A detailed description is given of rust spores trapping experiments by aeroplane and stationary slides, the results being shown in tabular form [*R.A.M.*, vi, p. 154]. The data obtained indicate that the rust epidemic in Manitoba in 1925 was initiated by a comparatively small number of wind-borne spores from the United States, the more so since both barberry and buckthorn [*Rhamnus*] are of rare occurrence in Manitoba, as shown by surveys made in the same year. A second stage in the development of the epidemic was characterized by a sudden large increase in the number of spores. From July 14th to 28th an average of 18 spores per square inch of land fell daily; these probably started the epidemic which broke out about the 1st of August, and during which the daily fall of spores per square inch reached about 1,100. The experiments are being continued and slides are to be exposed at a number of stations to determine the limits of the spread of the spores west and north.

MCLARTY (H. R.). **Report of the Dominion Field Laboratory of Plant Pathology, Summerland, B. C.**—*Rept. Dominion Botanist for the year 1925, Div. of Botany, Canada Dept. of Agric.*, pp. 102–116, 4 figs., 1926.

Experiments made in the spring of 1925 to test the value of certain cultural methods in the prevention of corky core of apples indicated that a good cover crop with even soil moisture conditions assists materially in reducing the disease.

Continuing his experiments on fireblight of the apple [*Bacillus amylovorus*: *R.A.M.*, v, p. 537], the author established that the disease is transmitted but very occasionally (in only two cases out of 528 inoculations) by pruning tools. A series of experiments is being conducted to determine the longevity of the fireblight organism in immature fruits.

A fairly detailed description is given of the perennial canker of the apple caused by *Gloeosporium perennans* [*R.A.M.*, v, p. 103],

which was reported in 1924 and 1925 from several of the apple growing regions of British Columbia.

Among the diseases of vegetable crops, the following are stated to have been of commercial importance: *Botrytis allii* and other storage rots of onions; Grand Rapids disease [*Aplanobacter michiganense*: loc. cit.]; and a bacterial soft rot of tomatoes. The bacterium isolated from the latter differs both from *Bacillus carotovorus* and from *B. aroideae*. A very serious disease of mangolds was recorded in the district of Kelowna, the infection ranging from 10 to 80 per cent. in one case. The first symptom is a cracking and wilting of the outer leaves; later the young leaves of the crown turn black and shrivel even before unrolling. Large cracks appear in the roots, and finally crown rot sets in about harvesting time. Isolations from affected roots yielded a species each of *Phoma*, *Alternaria*, and *Fusarium*, but the pathogenicity of these has not yet been established. It is considered probable that the trouble is to a certain extent of physiological origin.

DRAYTON (F. L.). **A summary of the prevalence of plant diseases in the Dominion of Canada 1920–1924.**—*Canada Dept. of Agric., Div. of Botany, Bull.* 71 (N. S.), pp. 1–61, 1926.

This is the first quinquennial report by the Division of Botany summarizing the prevalence of plant diseases in Canada during the years 1920–24 [*R.A.M.*, v, pp. 533–6]. The major diseases of the crops have been discussed in the annual reports, and the references which follow are to diseases newly recorded or those of restricted distribution.

On wheat, leaf spot (*Septoria tritici*) and black chaff (*Bacterium translucens* var. *undulosum*) were present in Manitoba and take-all (*Ophiobolus cariceti*) [*O. graminis*], and foot rot (*Wojnowicia graminis*) in Saskatchewan. The pycnidia of *Wojnowicia* on the host closely resemble the perithecia of *Ophiobolus*, but the growth in culture is quite different. Basal glume rot (*Bact. atrofaciens*) caused appreciable losses in the three Prairie provinces each year. Krinkle joint is a non-parasitic disease of wheat which is characterized by an abrupt bend on the lower internodes of the stems which break at these points as the plants mature; it occurred on the varieties Major and Preston in Saskatchewan in 1923, and in that province and Alberta in the following year. Halo blight of oats (*Bact. coronafaciens*) was common but not serious in the Prairie provinces, and leaf spot blotch (*Leptosphaeria avenaria*) was detected at Brandon, Manitoba, in 1923. Leaf rust of barley (*Puccinia simplex*) was recorded in Ontario, Quebec, and at Winnipeg, and stripe rust (*P. glumarum*) was collected on barley at Vermillion, Alberta, in 1924, the first record of this rust on cereals in Canada. Leaf spot (*Rhynchosporium secalis*) was detected on barley in Alberta and Saskatchewan, and *Dilophospora graminis* in Saskatchewan due probably to infection from neighbouring grasses. *Urocystis occulta* was present on rye in Alberta, Manitoba, and Ontario. Leaf spot (*Helminthosporium dictyoides* Drechsl.) affected 90 per cent. of the plants of meadow fescue (*Festuca elatior*) grown from Swedish seed at the Central Experimental Farm, Ottawa.

Pleosphaerulina briosiana was the cause of a new leaf spot of

lucerne at the Brandon Experimental Farm, Manitoba, in 1923, and anthracnose (*Gloeosporium caulivorum*) appeared on clover grown from European seed at the Central Experimental Farm, Ottawa. Stem break of flax (*Polyspora lini*) was recorded from two points in Saskatchewan in 1923 and from several points in the following year. Stem canker (*Ascochyta caulicola*) of sweet clover [*Melilotus alba*] was found in Alberta and Saskatchewan in 1923 causing severe injury to the yellow variety.

Dead arm (*Cryptosporella viticola*) has been an important disease of the vine in the Niagara peninsula, Ontario, since 1921. Powdery mildew of raspberries (*Sphaerotheca humuli* var. *fuliginea*) was recorded once from Manitoba, and mosaic, which was first noticed in that province in 1920, had been recorded from every province except Alberta by 1924.

Pod spot of beans (*Phyllosticta phaseolina*) was destructive in one county of Nova Scotia in 1924, and anthracnose of peas (*Colletotrichum pisi*) occurred in the west and Ontario. Skin spot of potatoes (*Oospora pustulans*) was found for the first time in 1921 in Manitoba and subsequently in Prince Edward Island. Records of prevalence of diseases on tobacco are available only for 1923–4; wilt (*Fusarium oxysporum* var. *nicotianae*) and angular leaf spot (*Bact. angulatum*) were present in Ontario and Quebec, but wildfire (*Bact. tabacum*) had not been recorded in Canada up to the end of 1924.

The prevalence of diseases on forest shade trees is reported by A. W. McCallum. Chestnut blight (*Endothia parasitica*) was present in Ontario, and blister rust (*Cronartium ribicola*) became general on both species of white pine (*Pinus strobus* and *P. monticola*) in the coastal zone of British Columbia after its first appearance in 1921. In Ontario and Quebec, the rust was prevalent on *Ribes*, but was not detected on native pines; in New Brunswick and Nova Scotia it was present on both hosts.

At Owen Sound, Ontario, in 1924, canker of rose (*Coniothyrium wernsdorffiae* Laub.) was detected—the first record for America. Streak (*Bacillus lathyri*) [*R.A.M.*, v, p. 636] was of frequent occurrence on sweet pea in Quebec in 1922.

In addition to diseases on crop plants a list is given of 131 fungi (mostly rusts) recorded with localities on 106 miscellaneous plants. The report is provided with a general index of diseases arranged according to the host.

SMALL (W.). **Matters of phytopathological interest during 1926.** —*Year-Book Dept. of Agric. Ceylon, 1927*, pp. 7–10, 1927.

In addition to information noticed in this *Review* from other sources the following matters are referred to in this report. A destructive smut of the cereal known as Job's tears (*Coix lacryma-jobi*) due to *Ustilago coicis* was recorded for the first time in Ceylon in February, 1926.

The carnation rust (*Uromyces caryophyllinus*) and rose mildew (probably *Sphaerotheca pannosa*) were both encountered recently. Spraying with Bordeaux mixture or sponging with potassium permanganate is advised for the former, as well as wide planting, and the selection of resistant varieties. For the latter a good preventive

is sulphur-lead arsenate dust (90 : 10) and control may be obtained by spraying with potassium permanganate or a solution of 1 part of sulphuric acid to 1,500 parts of water.

A premature falling of tea seed-capsules, due probably to drought followed by heavy rains, was experienced. Tillage and mulching are recommended to conserve the soil moisture during dry periods.

A root disease of coco-nuts, accompanied in young plants by a yellowing of the leaves and eventually by a rotting of the leaf bases, and in older trees sometimes by a condition known as tapering of the stem in which the leaves fade and finally the whole top of the tree falls, is fairly common in Ceylon. Six fungi (*Diplodia* sp., *Poria* sp., *Fomes lignosus*, *F. lucidus* [*Ganoderma lucidum*], *F. applanatus* [*G. applanatum*], and *Polyporus zonalis*) have been found associated with diseased trunks, and are now under investigation.

Some new facts regarding the disease of paddy [*Oryza sativa*] due to *Sclerotium oryzae*, have been ascertained. In older plants the sclerotia and hyphae of the fungus are found most abundantly in the stems and sheathing parts of the leaves at the third internode from the roots, i.e., probably at the water-level. A certain number of blackened roots infected with hyphae are found on the diseased plants and suggest soil infection, but so far attempts to cultivate these hyphae have failed. In young plants a yellowing of the leaves and a browning of their tips are also common and mycelium found in the stem at water-level has been shown to belong to *S. oryzae*. The same blackening of the roots was also observed, and the author considers there may be two methods of infection, and possibly more than one fungus is concerned with the disease. Although not always fatal to young plants, the presence of the fungus may lead to breaking of the stalks, and the production of shrivelled, valueless seeds, which have been found to contain sclerotia indistinguishable from those of *S. oryzae*. The only control method suggested is the early observation of young diseased plants, and the isolation of the infected areas by a bund.

Bericht der Lehr- und Forschungsanstalt für Gartenbau in Berlin-Dahlem für die Rechnungsjahre 1924 und 1925. [Report of the Horticultural College and Research Institute at Berlin-Dahlem for the financial years 1924 and 1925.]—*Landw. Jahrb.*, lxiv, *Supplement II*, pp. 65–70, 2 figs., 1926.

The following items of phytopathological interest are referred to in this report.

A peculiar disease of tulips was reported from many places in Germany in 1925. A white, cottony fungous growth visible on the tips of forced plants when in the cold frame, increased with extraordinary intensity and rapidity when forcing was continued in a closely ventilated house. The fungus, which was identified as a species of *Fusarium*, was found to attack the upper part of the plant enfolding the flower-bud, which failed to open.

Experiments were made in the summer of 1925 to test the efficacy of soil applications of various new disinfectants against club-root of crucifers [*Plasmodiophora brassicae*], using the seed of *Sinapis alba*, which had previously proved particularly susceptible to this disease.

Sulcum (Hoentsch, Dresden) and A. 55 [maker not stated] are stated to have proved unsatisfactory, whilst tillantin B (Hoechst Farbwerke) should be employed only at very low concentrations, as used even in the proportion of 0·75 per mille, it was found to produce stunted seedlings. Excellent results were produced with the uspulun-trockenbeize and uspulun-saatbeize (Bayer), as well as with the dusts No. 225 III, No. 225 V, and M.C. III (Saccharinfabrik, Magdeburg), even with the lowest concentration (0·75 per mille) in badly infected soil; and plants, the seeds of which had been subjected in the soil to a 1·25 per mille concentration were very satisfactory.

GERASSIMENKO (L. R.). Головніші шкідники та хороби сільськогосподарських рослин на Україні в **1926** р. [Principal insect pests and diseases of cultivated plants in the Ukraine in 1926.]—*Protection of Plants in Ukraine*, ii, pp. 7–19, 1926.

Root rot of sugar beet [*Phoma betae*: *R.A.M.*, iv, p. 391] is stated to have been severe early in 1926 in certain districts of the Ukraine, the amount of infection varying from 67 to 85 per cent. in some cases. In certain localities fairly heavy outbreaks were also recorded of *Puccinia tritici* and *Tilletia tritici* on wheat; *Puccinia dispersa*, *Scolecotrichum graminis*, and *Urocystis occulta* on rye; and *Ustilago hordei* on barley. Other diseases stated to have been of economic importance in that year were *Sphaerotheca mors-uvae* on gooseberry; red leaf spot (*Polystigma rubrum*) on plums; fruit rot (*Monilia* [*Sclerotinia*] *cinerea*) of cherries; white spot (*Septoria piricola*) and scab (*Fusicladium pirinum*) [*Venturia pirina*] of pears; and mildew of the vine (*Plasmopara viticola*). In the Kamenetz-Podolsk district tobacco suffered severely from an undetermined bacterial leaf spot.

GARDNER (M. W.). **Indiana plant diseases, 1924.**—*Proc. Indiana Acad. Sci.*, xxxv (*1925*), pp. 237–257, 7 figs., 1 graph, 1926.

This is the sixth of a series of annual reports recording the occurrence of plant diseases in Indiana [*R.A.M.*, v, p. 215]. The following items of importance not already noticed from other sources are included.

Apple scab (*Venturia inaequalis*) was prevalent, especially on Delicious, Rome, Wealthy, and Stayman varieties. Heavy scab infection caused considerable defoliation and retardation of growth in a plantation of unsprayed varieties. Blotch (*Phyllosticta solitaria*) was serious, and evidence was gained that the initiation of cankers of this disease at leaf scars on bearing wood is a result of mycelial invasion from basal petiole lesions. Black rot (*Physalospora malorum*) [*P. cydoniae*], in the form of a calyx-end rot of hanging fruit, caused heavy losses even in well sprayed trees, especially on Transparent, Delicious, Arkansas, Gideon, Wealthy, and Jonathan varieties. Fireblight (*Bacillus amylovorus*) was less destructive than in 1923, but was serious on the twigs of Jonathan and the blossoms of Grimes. Cedar rust (*Gymnosporangium juniperi-virginianae*) was prevalent in the south of the State, and owing to

the large amount of fruit infection, became a serious matter to commercial growers. Oldenburg, Delicious, Wealthy, Rome, Jonathan, and Red June were especially attacked, while Grimes, Stayman, Ben Davis, and Winesap showed relative resistance. The early scab sprays apparently did not prevent fruit infection by rust, but in the Oldenburg block sprayed for blotch the 2–6–50 and 4–6–50 Bordeaux sprays gave fair control of rust. Sooty blotch (*Phyllachora pomigena*) was serious on some varieties, and brown rot (*Sclerotinia cinerea*) and core mould caused by a species of *Alternaria* were also recorded.

Anthracnose of currant and gooseberry caused by *Pseudopeziza ribis* was extremely severe on the former, and resulted in premature defoliation in July and August. On the latter host leaf spot (*Mycosphaerella grossulariae*) caused serious defoliation in Miami county.

Strawberry leaf spot (*M. fragariae*) was generally prevalent, and a disease apparently of the mosaic type was found in plants of the Everbearing variety received from Michigan.

Net blotch (*Helminthosporium teres*), spot blotch (*H. sativum*), stripe (*H. gramineum*), and anthracnose (*Colletotrichum cereale*) were the most important diseases of barley noted.

Bacterial blight of beans (*Bacterium phaseoli*) was less destructive than usual; mosaic, anthracnose (*Colletotrichum lindemuthianum*), and rust (*Uromyces appendiculatus*) were also found on this host, while bacterial blight (*Bacterium phaseoli*) and bacterial spot (*Bacterium vignae*) were recorded on Lima bean [*Phaseolus lunatus*].

The most important disease of tomato from the point of view of reduction in yield was leaf spot (*Septoria lycopersici*). Early blight (*Alternaria solani*) was serious in transplant fields and plant beds, and bacterial spot (*Bacterium vesicatorium*) was much worse than usual.

RIVERA (V.). **Saggi di radioterapia vegetale.** [Plant radiotherapeutic tests.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 337–345, 2 graphs, 1926.

In this paper the author records the results of further investigations on the effect of irradiation with Röntgen rays on plant tumours caused by *Bacterium tumefaciens* [*R.A.M.*, vi, p. 18]. Amongst the numerous cases studied, two typical tests with *Ricinus* plants are described at length.

The first was carried out on three experimental tumours on a single plant. Exposure to the rays (3 ma., 180 kw., DF cm. 40, filterless,) for 2 and 4 minutes, respectively, on 11th May, resulted in an immediate stimulation of growth, which was particularly marked in the case of the shorter exposure. While the control showed throughout a steady rate of growth, after 2 months the growth of irradiated galls was arrested, and by the end of the season they were completely desiccated and dead. Similar results were observed in eight out of nine other comparable cases; in the ninth case no cessation of stimulation was observed after six months, this being attributable to a difference in sensitivity of the plant to the rays.

In the second experiment with similar technique radiations were given of 7, 15, and 30 minutes, respectively, to inoculations made the previous day. The control maintained a constant rate of growth as before whilst the growth of the irradiated galls was slower, more so in the case of that subjected to 15 minutes' exposure than in that of the 7 minutes, whilst no gall was formed after the 30 minutes' treatment.

In exposing galls to Röntgen rays, the author states that the growing points should be protected with lead, but no precautions are necessary with the older parts of the stem.

MURPHY (P. A.). **Common smuts or rusts on Corn crops.**—*Journ. Dept. Lands & Agric. Ireland*, xxvi, 3, pp. 199–207, 2 pl., 1927.

In this paper the author gives a popular account of the smut and rust diseases attacking cereals in Ireland. Covered smut of barley (*Ustilago hordei*) is stated to be of common occurrence, whilst loose smut (*U. nuda*) is rarely found. Loose smut of oats (*U. avenae*) occurs much more frequently than covered smut (*U. levis*), and wheat bunt (*Tilletia tritici*) is widely distributed while loose smut of wheat (*U. tritici*) is rather rare. Yellow stripe rust of wheat (*Puccinia glumarum*) is the most serious rust of cereals; black rust (*P. graminis*) is of negligible importance. Appropriate measures of control are indicated in each case.

KNÜPLING. **Das Trockenbeizen von Saatgut.** [Dust disinfectants for cereal seed.]—*Nachricht. über Schädlingsbekämpf.*, i, 4, pp. 174–177, 1 fig., 1926.

The author points out the advantages of the dusting over the steeping processes of cereal seed disinfection, the only drawback of the former consisting in the injurious effect on the health of labourers due to the inhalation of the poisonous dusts. To obviate this defect, the Thränhardt Works in Leipzig have constructed a special apparatus easily adaptable to various makes of seed mixers, which entirely eliminates the dispersion of the dust when transferring the seed from the mixer into sacks.

Trockenbeizmittel für Saatgutbehandlung. [Dusts for seed disinfection.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 3, pp. 30–31, 1927.

In publishing the present list of disinfectant dusts for cereal seed treatment attention is called to the fact that the German Plant Protection Service has not yet come to a final decision as to the advisability of adopting these preparations for practical use. The dusts included in the present list, however, gave satisfactory results in 1926. All the preparations have been comprised in previously published lists [*R.A.M.*, vi, p. 86], but trockenbeize 998 of the Saccharinfabrik A.-G., Magdeburg is stated to be effective against the stripe disease of barley [*Helminthosporium gramineum*] at the rate of 150 gm. per cwt. of seed.

Umbenennung von Saatbeizmitteln. [Renaming of seed disinfectants.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 3, p. 31, 1927.

The announcement is made that henceforth all the liquid seed disinfectants of the I. G. Farbenindustrie A.-G., Höchst a.M., will be known under the collective name uspulun, while all its disinfectant dusts will be collectively called tillantin. Thus, the preparation previously called tillantin nassbeize will now be named uspulun-universal, the trockenbeize höchst will be known as trockenbeize tillantin, and the former uspulun-trockenbeize as trockenbeize tillantin R.

ESDORN (ILSE). **Ueber die Prüfung von Beizmitteln.** [Note on the testing of seed disinfectants.]—*Pflanzenbau*, iii, 17, p. 276, 1927.

The method proposed by Rösch for the rapid testing of cereal seed disinfectants [*R.A.M.*, vi, p. 108] has been subjected by the present author to repeated experiment. She obtained a confirmation of Rösch's results in the case of loose smut of oats [*Ustilago avenae*], but claims that the method is not applicable to wheat bunt [*Tilletia tritici* and *T. levis*], since the mycelium is so slender that no traces of its penetration into the tissues of the seedlings can be observed in surface view. It is also stated that the method does not take into consideration the retarding effect of certain disinfectants on the germination of the smut spores which allows the seedlings to pass through their susceptible stage before infection can occur. The author considers, therefore, that the method needs further testing in conjunction with field trials.

GASSNER (G.). **Benetzungsbeize mit geringen Flüssigkeitsmengen.** [Sprinkling disinfection with small amounts of liquids.]—*Angew. Bot.*, ix, 1, pp. 1–12, 1927.

The disinfection of seed-grain with dusts, though it avoids the need for subsequent drying of the grain, is open to the objection that dusts employed are very poisonous and endanger the health of those who work with them. The author has, therefore, conducted experiments with a view to reducing the amounts of fluid required for the control of bunt (*Tilletia tritici*) of wheat by the sprinkling method.

Practical tests showed that with the help of suitable machinery the quantity of liquid could be reduced from 5 to 3 litres to the cwt. of grain. Subsequent laboratory experiments with solutions of colouring matters indicated that the rate of 1 to 1½ l. per cwt. was the minimum quantity required to cover the grain with a uniform film when the application was followed at once by thorough shaking for 2 minutes, and that the grain was then in a condition suitable for drilling without preliminary drying. An experiment, the results of which are tabulated, was carried out to determine the concentrations of segetan-neu necessary to effect control of bunt when the quantities of fluid used for sprinkling were varied from 1 to 5 l. per cwt. The conclusion reached was that a fixed weight of disinfecting agent is required for the unit weight of seed, and that in

consequence the concentration must be increased in proportion as the volume of liquid is reduced; complete control was obtained, and no injurious effect on germination was observed with concentrations as high as 2 per cent. when sprinkling was done at the rate of 1 l. per cwt. of seed-wheat. A further test with varying concentrations of agfa, germisan, uspulun, segetan-neu, and tillantin at the uniform rate of 1½ l. per cwt. gave similar results, though the disinfectants were not uniformly efficient; the best result was given by germisan, followed by tillantin and agfa, while segetan-neu and uspulun gave less reliable control; the treated grain could be drilled at once or with brief drying. An amount of fluid as low as 1½ litres to the cwt. cannot at present be employed owing to practical difficulties. The addition of soap facilitates uniform wetting, but trials showed that it lessened the action of the disinfectant. Complete control of bunt was obtained by sprinkling the grain with an emulsion of mercury-diphenol with lanoline at the rate of 0·5 l. per cwt., without affecting germination. Sprinkling with carbon tetrachloride [*R.A.M.*, v, p. 173], contrary to the statement of Fischer and Scharrer, failed to give appreciable control of bunt.

The author considers there are good grounds for expecting that means of treating seed-grain on a practical scale with minimal quantities of watery suspensions of disinfectants will be found and so combine the advantages of both wet and dry methods of seed disinfection.

GASSNER (G.). **Ueber primäre und sekundäre Beizwirkung.** [On the primary and secondary effects of disinfectants.]—*Angew. Bot.*, ix, 1, pp. 66-76, 1927.

The importance of controlling laboratory tests by field trials on the efficiency of disinfectants used for treating seed wheat against bunt (*Tilletia tritici*) is stressed.

The total disinfecting effect of an agent is the sum of the primary and secondary effects, the primary effect being restricted to the period of contact of the solution with the grain and ceasing as soon as it is dried, while the secondary effect is produced after sowing and during germination. Only the primary effect is, as a rule, measured in the laboratory, but field trials show the total effect. The relative amount of the secondary effect can be ascertained by reinfecting the disinfected grain with fresh spores before sowing. Disinfectants like formaldehyde and mixtures of alcohol and water, show no secondary effect, while in the case of dry disinfectants which are applied as dusts the effect is entirely secondary.

Laboratory tests indicated that segetan-neu, uspulun, and germisan were efficient in the order named for equal concentrations of mercury, but the results of field trials reversed the order, especially when the sprinkling method of disinfection was employed. Segetan-neu, and uspulun to a lesser degree, penetrate the walls of the spores and the seed-coats rapidly and form compounds with the cell contents so that the effect is mainly primary; germisan penetrates slowly, and is mostly deposited on the surfaces of the spores and grain, but gradually passes again into solution after sowing, and produces a considerable secondary effect.

RABATÉ (E.). **Action de l'acide sulfurique sur le piétin du Blé.** [The action of sulphuric acid on foot rot of Wheat.]—*Journ. d'Agric. Prat.*, xci, 7, pp. 133–135, 2 figs., 1927.

In this paper the author discusses certain theories put forward to explain the efficacious action of sulphuric acid against foot rot disease of wheat (*Leptosphaeria herpotrichoides* and *Ophiobolus graminis*) [*R.A.M.*, vi, p. 84]. The effect may be explained on the grounds that the growth of early sown grain favoured by a soft winter is arrested for a short time and an effect is produced comparable to that of a hard winter or late sowing. Another theory is that the external sheath of the seedling is dried up and perishes just before the underlying sheath becomes infected, thus preventing the development of the parasite. It was found that treatment with the acid was ineffective if the fungus had already passed to the second or third sheath, and that it was essential to stem the progress of the disease, either when it was incubating in the first sheath or just becoming visible. Contamination has been found to occur before the winter, when vegetation starts, and treatment with a 15 per cent. solution of sulphuric acid at the moment when the mycelium was penetrating from the foliage sheath to the stem of the seedling gave the most effective control. Experiments conducted at various places point to a lack of phosphoric acid in the soil as a factor in foot rot of wheat. Good results were produced with applications of ammonium sulphate or of sodium or calcium nitrates, and the author concludes that while *Leptosphaeria* and *Ophiobolus* are the determining causes of foot rot of wheat, insufficient nitrate or phosphate nutrition may aggravate the disease and that sulphuric acid is effective against the determining and aggravating causes alike.

POUZIN (P.). **A propos des traitements des semences contre la carie.** [Methods of treatment of seed-grain against bunt.]—*Journ. d'Agric. Prat.*, xc, 49, pp. 451–453, 1926.

The writer strongly advocates the substitution of dusting for the wet methods of seed-grain disinfection, as being far less injurious to the germinating power of the seed. Recent tests of the following dusts, neutral acetate of copper, dehydrated copper sulphate, with or without slag or lime, Schloesing vitrioline, copper carbonate, and copper oxychloride against wheat bunt [*Tilletia tritici* and *T. levis*] gave very satisfactory results in each case, no difference being observed in the effect of the various treatments [*R.A.M.* v, p. 220.]

BODNÁR (J.). **Warum ist das Kupfervitriol ein schädliches Beizmittel und von unsicherer Wirkung?** [Why is copper sulphate an injurious seed disinfectant of uncertain efficacy?]—*Mezögazdaság és Kertészet*, 8, 1st August, 1926. [Reprinted in *Nachricht. über Schädlingsbekämpf.*, i, 4, pp. 168–172, 1926.]

Experiments made by the Royal Hungarian Biochemical Institute are stated to have shown that, even at as low a concentration as 0·5 per cent., copper sulphate steeps impair the germination of wheat. As indicated by the author's repeated tests, the degree of injury is considerably increased, reaching from 20 to 25 per cent., when the

treated seed is stored in sacks for any length of time. In the case of bunt of wheat [*Tilletia tritici* and *T. levis*], it was also found that the spores of the fungus are not killed by the treatment, their germination being only inhibited by the presence of copper on the surface of the seed; by treating the spores with a weak solution of nitric acid in the laboratory, or by putting them in contact with soil under field conditions, their germinability was restored in full after the lapse of two or three days, this explaining, in the author's opinion, the often reported failures of copper sulphate in the control of bunt.

WINKELMANN (A.). **Methode zur Prüfung von Trockenbeizmitteln im Laboratorium (Vorläufige Mitteilung).** [A method of testing disinfectant dusts in the laboratory (Preliminary communication).]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 2, pp. 15–16, 1 fig., 1927.

The method briefly described in the present paper was devised by the author for testing in the laboratory the fungicidal value of disinfectant dusts in the control of seed-borne cereal diseases. The preliminary experiments were carried out on wheat bunt [*Tilletia tritici* and *T. levis*] as follows. A 50 gm. lot of infected wheat was thoroughly shaken for 3 minutes in an Erlenmeyer flask with the prescribed amount of the dust to be tested. Ten of the treated grains were then placed furrow downwards on the surface of soil (previously air-dried, passed through a fine sieve, and mixed with 15 per cent. of water) contained in a wooden box 10 by 6 by 2·5 cm., and covered with a similar box also containing soil but with a fine gauze for bottom. Moisture was maintained by spraying the soil in the top box with determined quantities of water, and the whole was kept at a temperature of 16° to 18° C. Determinations of the percentage of germination of the spores in the soil adhering to the grains were made on the 5th, 7th, and 10th days. Experience showed that it was preferable to kill the wheat grains before inoculating them with the spores, in order not to break up the soil by removing germinated and rooting seedlings. It was also shown that the viability of the seeds stood in no relationship to the germinability of the spores. This method is stated to have given satisfactory results in the testing of some seventy dusts, and a full report on the experiments is in preparation.

SAMPSON (KATHLEEN) & DAVIES (D. W.). **The influence of Tilletia tritici (Bjerk.) Wint. and Tilletia laevis Kühn on the growth of certain Wheat varieties.**—*Ann. of Appl. Biol.*, xiv, 1, pp. 83–104, 2 pl., 1 graph, 1927.

In continuation of their earlier work [*R.A.M.*, v, p. 412] the authors describe in this paper the results of their investigation of the effect of bunt (*Tilletia tritici*) on the growth and vegetative organs of the wheat plant. No appreciable difference was found in the percentage of germination of bunt-free and bunt-contaminated seeds. Observations on seedlings showed that a retarding influence on growth may, under certain conditions, be manifested, while measurements taken during the entire growth period showed that plants from grain infected with *T. tritici* exhibited a very

appreciable reduction in height [ibid., v, p. 352]. This was seen in the length of the straw at maturity as well as in the length of the ripe ear. In the case of Hen Gymro the reduction in height was as much as 16 to 19 per cent., and with April Bearded, 13 per cent. Tillering, on the other hand, appeared to be stimulated by the parasite. In one experiment bunted plants, at the period of maximum tiller development, produced 16 per cent. more tillers than healthy plants grown under exactly the same conditions. At maturity the number of heads per plant was less than the total number of tillers produced, but bunted plants still showed an increase over healthy ones. In one experiment, data on the dry weights of roots at maturity revealed a decrease of 22 per cent. in the case of bunted plants. Bunt caused by *T. levis* was observed in one experiment, and from this it appears that the influence of this species tends in the same direction as that of *T. tritici*, though its action is stated to be distinctly weaker [loc. cit.].

STEWART (G.). **Correlated inheritance in Wheat.**—*Journ. Agric. Res.*, xxxiii, 12, pp. 1163–1192, 3 figs., 1 graph, 1926.

This paper includes a section [pp. 1168–1170] dealing with tests of the susceptibility of wheat hybrids to rusts. Of 55 pure lines, raised in 1924 from the cross Dicklow × Sevier, two, G 40 and G 149, were found to be highly resistant in the field. In 1925 seedlings of these two strains, of both the parents, and of Marquis, were subjected to greenhouse tests in which nineteen physiological forms of stem rust (*Puccinia graminis tritici*) were employed. Dicklow was found to be completely susceptible to all forms, Sevier was somewhat resistant and G 40 about the same, but G 149 was considerably more resistant than Sevier against all the forms used.

Leaf rust [*Puccinia glumarum*] tests showed infection in about 75 per cent. of Marquis, 80 per cent. of G 40, and 22 per cent. of G 149. Occasionally a plant resistant to both stem and leaf rust arose in the progeny of the Dicklow × Sevier cross.

In 1925, in nursery tests, one additional pure line, G 84, was found to be fully as resistant to stem rust as G 149; and G 40 and G 149 again proved highly resistant. Pure lines G 40 and G 149, together with other varieties, were tested in the international uniform rust nurseries of the United States and Canada. The percentages of infection in Kota, Kota × Marquis, and Ceres were respectively 6·59, 4·92, and 8·62, while in Marquis it was 26·60. In G 40 and G 149 the figures were 4·15 and 3·88 per cent., respectively. These were the least infected of any strains of *Triticum vulgare* tested in 1925.

HENNING (E.). **Berberisutrotning med hjälp av statsmedel.** [Barberry eradication with the help of State subsidies.]—*Landtmannen*, ix, 49, pp. 988–989, 1926.

In continuation of his earlier attempts to secure the promulgation of effective legislation against black rust of wheat [*Puccinia graminis*] in Sweden [*R.A.M.*, vi, pp. 20, 21], the writer urges the need for immediate action in the matter of barberry [*Berberis vulgaris*] eradication. In certain districts this work would serve to relieve the prevailing unemployment, while in others the issue

of State subsidies would be necessary for the accomplishment of the campaign.

HENNING (E.). **Predisponerande betingelser för svartrosthärjningar.** [Conditions predisposing to black rust epidemics.]—Reprinted from *Landtmannen*, [ix], 51–52, 4 pp., 1926.

After a brief, popular description of the life-history of black rust of wheat [*Puccinia graminis*], the writer defines the various environmental conditions predisposing to epidemics of the disease. Sharply alternating day and night temperatures during the summer months have been observed to cause heavy infection in America, England, Italy, and Germany. A number of examples are cited illustrating the writer's observations on the correlation between weather conditions and the incidence of black rust in Sweden. Plentiful applications of nitrogenous fertilizers have been found to increase the amount of infection, while potash and phosphates reduce it. The disease is more prevalent on heavy clay than on light soils. Late and dense sowing also appear to favour the occurrence of black rust, which is particularly severe in narrow, enclosed valleys. Brief observations are made on the rôle of the barberry [*Berberis vulgaris*] in the spread of black rust, and on the existence of different biological forms of the fungus.

THOMPSON (N. F.) & ROBBINS (W. W.). **Methods of eradicating the common Barberry (Berberis vulgaris L.).**—*U.S. Dept. of Agric. Bull.* 1451, 46 pp., 13 pl., 1926.

This is an exhaustive account of mechanical and chemical methods of eradicating the common barberry (*Berberis vulgaris*). Attention is drawn to the horizontal rhizomes and large horizontal roots of this plant, and it is emphasized that all parts of these organs must be removed or destroyed if eradication is to be successful.

Various mechanical methods of eradication are described, but all these are unsatisfactory or very expensive. Such methods, however, must be used in cases where chemical treatment would be dangerous to other valuable plants in the same area.

A satisfactory chemical for use in barberry eradication must be effective, easily available, cheaper than and equally effective as grubbing, easy to handle, and not dangerous either to those handling it or to useful vegetation in the soil. Of 37 substances tested, common salt [*R.A.M.*, ii, p. 399; iv, p. 269] gave 100 per cent. efficiency, whilst the approximate cost was 10 cents per bush. Kerosene [*R.A.M.*, iv, p. 269] also caused 100 per cent. mortality of bushes but at an average cost of 13 cents. per bush; it was also somewhat slow in acting. With sodium arsenite [*R.A.M.*, ii, p. 399; iv, p. 532] a similar standard of efficiency was gained at the average cost per bush of 8 cents, but with the disadvantage that this chemical is very poisonous.

GREGORY (C. T.) & MAYER (I. D.). **Observations on damage to drills by copper carbonate treated Wheat.**—*Proc. Indiana Acad. Sci.*, xxxv (*1925*), pp. 265–267, 1 fig., 1926.

Damage to drills during the process of sowing wheat treated

with copper carbonate was frequently reported during the last two years in Indiana. This injury was associated with only one type of drill, the so-called 'internal or double run grain feed', in which the surface exposed to any friction from the wheat is large compared with other types. Laboratory experiments showed that under dry conditions the presence of copper carbonate on the surface of the seed increased the friction about 14 per cent. Further tests proved that while the wheat was dry the addition of the chemical did not increase the friction sufficiently to cause injury to the drill, but that moisture was the essential factor in producing trouble. This evidence was confirmed by farmers' observations. If treated wheat is left over night in the drill during wet weather, it is necessary to make sure that the feed gears work freely before starting the drill lest the excessive power needed result in breakage.

GILBERT (B. E.), MCLEAN (F. T.), & HARDIN (L. J.). **The relation of manganese and iron to a lime-induced chlorosis.**—*Soil Science,* xxii, 6, pp. 437–446, 1926.

This paper deals with a chlorotic condition of various crops, particularly oats, spinach, lettuce, corn, beets, and beans on soils limed to the neutral point [*R.A.M.*, v, p. 397]. Analytical experiments showed that these symptoms were not due to a deficiency of iron, since the iron content of chlorotic plants equalled or exceeded that of normal plants, and iron treatment was ineffective in curing the malady. That the condition was not due to a lack of magnesium was likewise proved. Previous tests had shown that applications of manganese salts cured the chlorosis [loc. cit.] and further experiments showed that spraying even at the rate of 0·3 lb. per acre of manganous sulphate produced a marked benefit. The chlorotic plants when analysed showed a lower manganese content than healthy plants on more acid soils. The apparent manganese requirement of the plants is small, between 0·002 and 0·006 per cent. of the dry matter in the case of oats and spinach.

DELORME (E.). **Accidents et maladies du Seigle.** [Injuries and diseases of Rye.]—*Journ. d'Agric. Prat.*, xc, 45, pp. 371–372, 1926.

The author describes in brief, popular terms various troubles to which rye is subject in France. The shedding of the grain may arise, apart from climatic injury, from lack of nitrogen and phosphates, and in such cases he advises the application of from 400 to 500 kg. of phosphate slag per hect. in the autumn and two dressings of sodium nitrate (80 to 100 kg.) in the spring.

Against rust on rye [*Puccinia dispersa*], the use of resistant varieties, such as those from the Poznán (Poland) agricultural station which have been much sown in France of late years, is advocated.

Ergot of rye [*Claviceps purpurea*] is said to have been very prevalent in certain districts in 1926. For the control of this disease it is advisable to avoid growing the rye too often on the same soil, and in every case diseased grain must be sorted.

FRON (G.). **L'ergot et sa culture.** [Ergot and its culture.]—*Ann. Sci. Agron.*, xliii, 4, pp. 314–324, 2 figs., 1926.

In this paper the author gives an account of experiments on the artificial cultivation of ergot (*Claviceps purpurea*) on rye [*R.A.M.*, ii, p. 400].

A pure culture was obtained from perithecia formed on ergot overwintered in soil and was grown on various media such as rye, malt, and cherry extracts with or without gelatine, the best results being obtained on the liquid media.

Abundant, flocculent colonies formed in four days in the rye and malt extract media at a temperature of 20° to 25° C. These colonies became dense, their colour, at first identical with that of the medium, lightened considerably, and they rose to the surface of the liquid. They consisted at this stage almost exclusively of conidia, which were very abundant on the rye extract. On gelatine development was slower and the stromata produced fewer conidia, which germinated at once.

Infection tests were carried out on ordinary March rye and improved summer rye with cultures in liquid media diluted in sterilized water. These were sprayed on to the ears in their various stages of development. The rye inoculated when in flower was not attacked by ergot; but about 20 per cent. of the harvested yield from rye inoculated when earing had just begun was infected, some of the ears containing as many as seven sclerotia. On the basis of this percentage the author estimates a yield of 200 kg. per hect. would be obtained.

WENHOLZ (H.) & DARRAGH (W. H.). **The root, stalk, and ear rot diseases of Maize. Suggestions for their control.**—*Agric. Gaz. New South Wales*, xxxviii, 1, pp. 39–49, 3 figs., 1927.

Diseases which cause rotting of the roots, stalks, and ears of maize are stated to be much on the increase in New South Wales and are estimated to cause an annual loss of from 5 to 10 per cent. of the yield.

The injury to the plant is generally most marked in the roots, which often rot away completely, so that the stalk can be readily pulled out of the ground. In some cases the stalk is attacked to a height of several nodes above the ground, but may still appear quite sound externally. This rotting cuts off the moisture and food supply to a large extent, causing poorly developed, pinched grain. The infected plant often puts out brace roots from the nodes above the rotted part of the stem, in which case it may recover sufficiently to produce plump grain.

A species of *Fusarium* [? *F. graminearum*] is easily identifiable on diseased shoots and roots of growing plants, and is thought to be the conidial stage of a species of *Gibberella* [? *G. saubinetii*] which occurs on dead maize stalks left on the ground during the winter. The spores from the latter germinate in spring or summer, giving rise to the *Fusarium* stage.

Infection may take place through the roots, through the tender ear shoots behind the leaf sheaths, at the nodes, or through the silks from air-borne spores. This last method causes characteristic splitting of the grains, which become full of *Fusarium* spores.

Systemic infection of the grain by mycelium from diseased stalks also occurs, and most of the failure in germination or stand is stated to be due to the use of infected seed.

Measures recommended for the control of the disease include: (1) careful and early selection of seed in the field; large producers are advised to sow a few acres with field-selected seed to keep as a special seed area; (2) burning of all stalks; (3) crop rotation; and (4) late sowing. The possibility of seed treatment with mercury-phenol compounds and control by breeding is also briefly discussed.

BERTUS (L. S.). **A sclerotial disease of Maize (Zea mays L.) due to Rhizoctonia solani Kühn.**—*Year-book Dept. of Agric., Ceylon, 1927*, pp. 44–46, 1 pl., 1927.

A description is given of the symptoms of a disease of maize due to *Rhizoctonia solani*, the sclerotia of which were found on and between the leaf sheaths of the stem, and of the female inflorescence. The effect of the fungus was to arrest the development of the flower or, in the case of basal attack, to cause withering; sometimes the plants were killed outright. Olive-brown lesions were found on the stems underneath similarly coloured patches on the leaf sheaths, and hyphae occurring on the former were proved to be those of *R. solani*. Pure cultures of the fungus were obtained from the superficial hyphae, from the discoloured tissues below the lesions, and from the sclerotia; and the cultural characters were similar in each case. The perfect stage of the fungus (*Corticium vagum*) [*C. solani*] is stated to have been recorded on potato, groundnut (*Arachis hypogaea*), and *Vigna oligosperma* in Ceylon [*R.A.M.*, v, p. 517].

A search for this disease on plants growing in the vicinity of the affected maize was unsuccessful, and it was concluded from this, and from the fact that affected plants showed healthy roots, that infection of the maize took place by wind blown spores of *C. solani* from some jungle plant, rather than from the soil. Maize seedlings planted in infected soil were found to damp off in about six days and it was observed that seedlings susceptible to attack when young, acquire immunity when older.

Control of this disease when the soil is infected with sclerotia is a serious problem. Efforts in cases like the present should be directed towards killing the spores of *C. solani* which may be present on apparently healthy plants, and towards destroying all plants bearing sclerotia as soon as possible. Care should be taken in handling these plants to prevent the sclerotia falling to the ground and infecting the soil.

OCFEMIA (G. O.) & ROLDAN (E. F.). **Phytophthora blight of Citrus.**—*Amer. Journ. of Botany*, xiv, 1, pp. 1–15, 2 pl., 1927.

A seedling and shoot blight of citrus varieties has been prevalent during the rainy season, at the College of Agriculture, Los Baños, Philippine Islands, since 1919. Water soaked lesions which become dark-coloured start usually at the tips of the shoots and extend backwards to the woody tissues, causing a shooting of the buds below the margin and an appearance resembling a witches' broom.

In rainy weather 90 per cent. of the seedlings in seed-beds and 30 per cent. of the succulent shoots on budded citrus plants may be killed off by the disease. A *Phytophthora* has been isolated from the lesions, and inoculations have shown it to be the cause of the blight; the fungus is a strain of *P. faberi* which develops sporangia abundantly and rapidly on oatmeal agar, the majority of which after two to three weeks measure from 33·5 to 57·5 by 19·5 to 35·5 μ, the mean size being 44·7 by 29·5 μ. Chlamydospores, the greatest number of which have a diameter between 35·5 and 37·5 μ, are also produced freely, but oospores have been found neither in cultures nor on the host. The sporangia and chlamydospores of this strain are smaller than those of the strains described by Reinking on coco-nut and cacao [*R.A.M.*, iii, p. 396] in the Philippines.

Inoculations on fruits of eggplant and pepper, cacao pods, and seedlings of papaw (*Carica papaya*) and coco-nut yielded positive results. The species of citrus most susceptible to blight at the College of Agriculture is the mandarin orange (*C. nobilis*); the sour red lemon (*C. limonia*) and the pomelo (*C. maxima*) show medium infection; the sour orange (*C. aurantium*), citron (*C. medica*), and lime (*C. aurantifolia*) slight infection; while the calamondin (*C. mitis*) remained practically free from infection. In 1919 treatment of infected budded citrus plants in nursery rows with Bordeaux mixture (4–4–50) resulted in a considerable reduction of disease.

BARTHOLOMEW (E. T.). **Alternaria rot of Lemons.**—*California Agric. Exper. Stat. Bull.* 408, 38 pp., 3 pl. (1 col.), 1 fig., 1926.

Alternaria rot of lemons (*A. citri*) [*R.A.M.*, iv, p. 539] is very prevalent in all the lemon growing regions of California. The fruits are potentially infected before picking, but decay does not usually set in till after they are placed in storage. When stored at a temperature of 55° to 60° F., rot will generally appear in tree-ripe fruit in four to six weeks; in silver fruit in two to two and a half months; and in green fruit in three to four months. This disease is not to be confused with internal decline [ibid., v, p. 667] of lemons, which is regarded as a purely physiological affection since experiments showed that affected fruits did not develop any increase of the symptoms in storage, and since no fungus could be isolated from fruits showing only symptoms of internal decline. The actual decay of healthy lemons or of those affected with internal decline was caused in every case by the *Alternaria*. A table is given of the characters distinguishing the two diseases; the *Alternaria* rot starts at the stem end and the peel is the last part to become infected, whilst internal decline starts at the stylar end and is most pronounced in the peel. The temperature range found to be the most suitable for the development of the fungus in the lemon tissues or in culture was approximately 78° to 83°.

A series of control experiments showed that methods generally in use for orchard spraying or fruit sterilization before storage are quite unsuccessful. A 0·1 per cent. solution of mercuric chloride for two minutes was effective in killing isolated spores and mycelium, but a six to eight minutes' soaking was required to kill the fungus when occurring on the fruits, buttons, or twigs. The removal of the buttons proved ineffective and also impracticable.

It was found that in general, the fungus, although present on and under the button, has not actually penetrated inside the tissues when the lemons are picked. The organism enters the fruit directly from the button, or from spores or mycelium harboured between the button and the lemon.

From a microscopical study of the button tissues, it was shown that attempts at sterilization were unsuccessful because the sterilizing liquid was unable to reach the spores and mycelium sheltered in crevices or depressions, or the mycelium which in most cases had already penetrated the button tissue. It was seen too that the button tissues retard the advance of the fungus by the formation of a corky layer. The organism seems first to follow the bundle sheath, and subsequently passes into the parenchyma and xylem.

In the absence of any definite procedure for control, certain recommendations likely to reduce the amount of rot are given, of which the following may be mentioned. The trees should be treated so as to produce as regular growth as possible. The fruit should be picked when silver or green, and during storing should be kept at a low temperature (55° or under). Before packing, samples of each lot of fruit should be carefully examined by slicing off the stem end just below the button, when the cut surface will show a pinkish or light brown colour if infected with *A. citri*. Fruit showing more than an extremely low percentage of infection should not be shipped.

NOLLA (J. A. B.). **The anthracnoses of Citrus fruits, Mango and Avocado.**—*Journ. Dept. Agric. Porto Rico*, x, 2, pp. 25–63, 6 pl., 1926.

The author has studied in detail the fungi associated with anthracnose in mango, avocado, and citrus fruits, and has reached the conclusion that under Porto Rican conditions, *Colletotrichum gloeosporioides* Penz. is the cause of the different manifestations of disease on the mango, orange, pomelo, lemon, and perhaps avocado, and further that it can, and does, cause withertip and leaf spot of the lime; fruit spot and fruit canker of the lime, however, are exclusively caused by *Gloeosporium limetticolum* Claus. which may also cause withertip and leaf spot symptoms. He bases his opinion on numerous inoculation experiments.

Working with a considerable number of isolations, he differentiates these two species in culture as follows: *C. gloeosporioides* is constantly a quicker grower and is more resistant to acid and alkali; its aerial mycelium is profuse, white or dark, the acervuli usually numerous, large; and the substratum coloured some shade of green, olive, or brown. In *G. limetticolum*, the aerial mycelium is scanty and always white; the acervuli are usually numerous and small, and the substratum is coloured light salmon-orange or apricot-orange.

It was not found possible to differentiate the two species on their spore size or shape; different strains of each species have different mean spore lengths, and the mean spore length of each strain was found to vary with the medium. In each species, the spores show both blunt and acute ends, and may be somewhat constricted in the middle. *C. gloeosporioides* usually forms setae on carbohydrate

media, but *G. limetticolum* has not been observed to do this under similar conditions. The conidiophores of *G. limetticolum* are lighter in colour on all culture media, and the vacuoles of its conidia are larger and more numerous than in *C. gloeosporioides*.

A bibliography of 44 titles is appended.

NARASIMHAN (M. J.). **Wild plants affected by koleroga.**—*Mysore Agric. Calendar*, pp. 36–37, 1927.

In this brief report the author states that the koleroga disease of areca nut (*Phytophthora*) [*arecae*: *R.A.M.*, v, p. 361] in Mysore was much less prevalent than usual during 1926 owing to the moderate rainfall. The disease is said to be only in evidence till the end of the south-west monsoon, after which it apparently entirely disappears. It is thought that the fungus is carried over the hot season as oospores on rotting areca nuts, but probably the chief source of infection is from certain wild plants of which the following have been found to be affected: *Colocasia antiquorum*, *Bryophyllum calycinum*, *Santalum album*, *Artocarpus integrifolia*, *Mangifera indica* on the leaves; *Ficus nitida*, *Jatropha glandulifera*, *Citrus medica*, *C. limonum*, and *Hevea brasiliensis* on the fruits. So far oospores have been found in nature only on *F. nitida*, *C. medica*, and *B. calycinum*.

CHABROLIN (C.). **Une maladie du Palmier-Dattier en Tunisie.** [A disease of Date Palms in Tunis.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 310–313, 1926.

A disease of date palms (*Phoenix dactylifera*) occurring in southern Tunis has recently been investigated. The depleted floral axis showed a whitish, tomentose coating on the middle portion of the axis, and dark, elongated spots on the lower portion, exactly as in the case of the disease reported in Cyrenaica in 1925 and attributed by Cavara to *Mauginiella scaettae* [*R.A.M.*, iv, p. 477]. A microscopic examination also confirmed the identity of the two parasites though the spores in the present instance measure 7 to 10 μ (most frequently 8 μ) as compared with 10 to 12 μ in the Cyrenaica type.

The author states that the fungus not only attacks the male inflorescence but also the female inflorescence before it emerges from the sheath, thus destroying the whole of the crop from otherwise vigorous trees.

In a footnote it is stated that M. Foëx considers the disease in question to be identical with that described by M. Vayssière and himself under the name 'doudah' from specimens received from Morocco (*Journ. d'Agric. trop.*, xix, pp. 336–339, 1919).

RAGUNATHAN (C.). **Leaf-break disease of Coconuts.**—*Year-Book Dept. of Agric., Ceylon, 1927*, pp. 25–26, 1 pl., 1927.

Leaf break disease of coco-nuts, first recorded in Ceylon in 1918, was found in 1926 at Chilaw and Kurunegala. The disease generally starts from the apex of a leaflet of one of the older leaves and progresses downwards. The leaflet turns grey, withers' and finally becomes brown. The mid-rib at the base of such leaflets shows a dark brown discoloration which gradually spreads, and the

margins of these areas are characterized by yellow and red-brown zones. Above this point the leaf dies, and the fracture which gives the disease its name takes place where the mid-rib is attacked, most commonly about the middle or lower down. The broken withered distal portion remains hanging vertically downward.

A species of *Botryodiplodia* and *Pestalozzia palmarum* were isolated from diseased coco-nuts, and inoculations with these fungi (16 and 14, respectively) carried out on mid-ribs of the leaves of healthy plants gave positive results in each case where the tissues were wounded, but uniformly negative results on unwounded tissues. The former fungus rapidly produced typical discolorations of the mid-rib and the latter a grey central area with a brown margin, but no leaf breaks have so far been obtained from any of these inoculations. The author concludes that the *Botryodiplodia* is a wound parasite of the coco-nut, and it is, as in other countries, associated, together with other fungi, with the leaf break disease in Ceylon.

As remedial measures, the writer recommends cutting away the diseased parts of leaves as soon as they appear and burning them on the spot.

FAHMY (T. E.). **The wilt disease of Cotton.**—*Congress of the Intern. Fed. of Master Cotton Spinners' Manufacturers Assoc. Egypt.*, 3 pp., 1927.

The author describes the symptoms of the wilt disease (*Fusarium* sp.) [*F. vasinfectum*] of cotton [*R.A.M.*, v, pp. 20, 767] as it occurs in the cotton growing areas of Egypt, chiefly in the Delta region. The plants are infected in the seedling stage through the root system, and generally die owing to a complete rotting of the roots. Different varieties of cotton show a marked variation in susceptibility to the disease. Sakel is extremely susceptible, while Ashmouni and Zagora are immune. Breeding experiments have, however, resulted in the isolation of four strains of Sakel, which are of good quality, and which so far appear to be quite immune from wilt.

RHIND (D.). **Preliminary note on an internal boll disease of Cotton in Burma.**—*Agric. Journ. of India*, xxii, 1, pp. 34–38, 1927.

In November, 1925, an internal disease of unripe cotton bolls, characterized by a yellow discoloration of the lint followed by a rotting of the whole contents of the fruits, was observed in association with two species of *Nematospora*. Examination of a large number of immature bolls of all varieties showed boll-worm attack in 30 per cent., but on four farms from 43 to 100 per cent. of the bolls of Wagale and Wagyi, two Burmese types, and Cambodia, an American variety, were found to have the internal rot, although free from boll-worm infestation; the disease was found in every cotton field inspected. It was observed to increase up to the end of January and then to decrease and disappear in March, in correlation with the increase and decrease in the numbers of red bugs (*Dysdercus cingulatus* A). When diseased bolls, which always appear healthy externally, are cut open, proliferations are found in

the inner surfaces of the walls where punctures by these insects have occurred, and in early stages a small patch of yellowed lint marks the site. The two species of *Nematospora*, which have been found in 99 per cent. of the bolls examined, are Nowell's forms C and D [*N. gossypii* and *N. coryli*: *R.A.M.*, v, p. 389] the first-named being the more common.

Several series of inoculation experiments were carried out by injecting, with a hypodermic syringe, spore suspensions taken from pure cultures of *N. gossypii* [*R.A.M.*, vi, p. 163]. In a number of cases the bolls were destroyed by boll-worm, but in one series, where the plants had been kept under mosquito netting for 5 weeks to exclude insects, rotting had begun 7 days after the injections were made and was complete after 20 days, the controls remaining healthy. Subsequent inoculations were performed by introducing red bugs, which had fed on diseased bolls, into the cages, where they were allowed to remain for 32 days, when the bolls were examined. The results, which are tabulated, showed that in one case 18 out of 24 bolls and in another 10 out of 11 bolls were internally decayed and contained the fungus; while all the controls, to which no bugs had been admitted, remained healthy. These results indicated that the red bug was intimately connected with the spread of the disease. The internal rot is stated to be the most serious disease of cotton in Burma, and may render the cultivation of the highly susceptible Cambodia variety unprofitable in that country.

ROSEN (H. R.). **Efforts to determine the means by which the Cotton-wilt fungus, Fusarium vasinfectum, induces wilting.** —*Journ. Agric. Res.*, xxxiii, 12, pp. 1143–1162, 3 figs., 1926.

This paper contains a description of a large number of experiments in which pure cultures of different strains of the cotton wilt fungus (*Fusarium vasinfectum*) were grown on various liquid media, the fungus removed from these, and toxicity studies carried out with the filtrates.

Filtrates of cultures grown in Richards's solution were quite toxic to cotton plants, while those of cultures in media containing organic nitrogen were non-toxic. The decrease in acidity found in Richards's solution after growth of the fungus for two to three weeks was not a factor rendering the filtrates toxic, and the fact that the toxicity of Richards's solution was not due to increase in osmotic pressure was proved by dilution of the filtrate. In very bright sunlight, it was noticed that filtrates caused wilting much more rapidly than in diffused light.

After distillation *in vacuo*, or ordinary boiling, the distillates, as well as the residues, possessed toxic properties, the residues being very much more toxic. The distillates were alkaline in reaction, and gave negative results when tested for amines and alkaloids. After two to three weeks in Richards's solution positive tests were obtained for nitrites, which were found in quantities varying from 0·0125 to 0·04 mgm. of nitrogen per c.c. of solution. A comparable concentration of chemically pure sodium nitrite was found to be markedly toxic to cotton plants.

The conclusion is drawn that the filtrates of cultures of *F.*

vasinfectum on Richards's solution possess at least two substances toxic to cotton plants. One is a volatile compound with an alkaline reaction, and the other is an inorganic salt in the form of a nitrite. The wilting of cotton infected with this fungus is considered to be due to poisonous chemical substances formed by the fungus. This theory of poisoning, rather than the blocking of xylem elements by the fungus hyphae, is strengthened by microscopical examination of the water-conducting tissues.

SMITH (E. C.). **Prickly heat: its aetiology and pathology.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, 5–6, pp. 344–351, 30 figs., 1927.

The author, who is attached to the Medical Research Institute, Lagos, Nigeria, concludes from the investigation reported in this paper that the affection known as prickly heat is a dermatitis of mycotic origin, the causal agent belonging apparently to the *Monilia* [? *Candida*] group. He states that a fungus showing yeast-like forms and branching mycelium has been demonstrated in the epidermal scales of persons affected with this condition. In culture this fungus appears as masses of budding yeast-like bodies, though a few of the strains show short, scanty mycelial elements. By inoculation on human skin a lesion was obtained comparable to prickly heat in an aggravated form. The fungus which was isolated from the experimentally produced lesion, on reinoculation, gave rise to a similar epidermal lesion. Sections of the experimental lesion showed the presence of a yeast-like fungus in the horny epithelium, in the roofs of the vesicles or pustules, and in the superficial parts of the hair follicles.

WILENCZYK (A.). **Le Trichophyton et ses variétés en Pologne.** [*Trichophyton* and its varieties in Poland.]—*Comptes rendus Soc. de Biol.*, xcvi, 5, pp. 349–352, 3 figs., 1927.

In the course of two years' study on mycosis in Poland, the writer studied two hundred cases, in 154 of which he found *Achorion*, principally the *Achorion* of Schönlein [*A. schönleini*], and only in two cases succeeded in cultivating *A. quinckeanum*. Species of *Trichophyton*, though more frequently met with now than before the war, are said to be rare in Poland. Formerly they occurred chiefly in children, but are now frequently found in adults. *T. violaceum* is the most widespread type, and may be identified by the violet colour of the culture and the furrows on the surface of the culture; frequently, however, the colour remains yellow or light brown, or occasionally loses its original colouring if transferred to a fresh medium; the variety may then be identified from hanging drop cultures in which the fungus forms no conidia, and presents an appearance very reminiscent of Schönlein's *Achorion*.

The second most frequent species, *T. plicatile*, occurs chiefly on the hairy parts of the face. A typical culture of *T. crateriforme* was obtained from the hair of a child's head, and of *T. cerebriforme* from the hair on an adult's face. Both species produce superficial symptoms in man. Among the species found on animals, the most frequent in Poland is *T. granulosum*, mostly on smooth skin. In

hanging drop cultures, this species forms small, round conidia, weakly attached to their conidiophores. *T. niveum*, *T. equinum*, and *T. rosaceum* are seldom found in Poland.

Two species, which the writer could not identify with any of the known species of *Trichophyton*, are designated *Trichophyton* A. and *Trichophyton* B. The former recalls *T. equinum*, except that it does not produce a red coloration on Sabouraud's medium, the growth on potato is white, and it is difficult to inoculate into animals. The latter, which in hanging drop cultures resembles Schönlein's *Achorion*, produced on Sabouraud's medium a wrinkled culture of a yellow colour. In a few weeks this yellow colour deepened and became greenish, then grey, sprinkled here and there with dark marks caused by black granules.

MONTEL (R.) & PONS (R.). **Dermatite blastomycosique chéloïdienne.** [Cheloid blastomycetic dermatitis.]—*Bull. Soc. Path. Exot.*, xix, 10, pp. 876–880, 2 figs., 1926.

In this paper the authors discuss an affection on the skin of a native of Cochin China, which was characterized by crateriform ulcerations and intradermic nodules, and when healed by cheloid scars.

The fungus obtained from the diseased region produced in culture yeast-like bodies, from 5 to 6 μ in diameter, sometimes slightly ovoid, but more often spherical. After a time the edges of the streak assumed a slightly downy appearance, and microscopic examination revealed the presence of hyphae, extending over the surface of the medium. Cultures of ten days' standing were observed to contain large club-, pear-, sac-, and gourd-shaped forms measuring as much as 20 μ.

The cultural characters of the organism on various other media are described. The authors consider the fungus as belonging to the Blastomycetes, but were not able to identify it with any known species.

MOURASHKINSKY (K. E.). О пыльной головне американского Пырея. [Loose smut of American Rye Grass.]—*Trans. Siberian Acad. of Agric. & Forestry*, vi, 9, 4 pp., 1926. [German summary.]

Western rye grass (*Agropyron tenerum*) [stated to have become of recent years an important forage crop in Western Siberia] was found in 1926 to be attacked in the neighbourhood of Omsk by a loose smut, the symptoms and the morphology of which are indistinguishable from those described by Fraser and Scott from Canada [*R.A.M.*, v, p. 741]. In view, however, of Liro's work [ibid., iii, p. 369] establishing the narrow specialization of *Ustilago bromivora* to species of *Bromus*, the present author considers that the reference by Fraser and Scott of the rye grass smut to this species is incorrect, and assigns it to *U. bullata* Berk., while pointing out the great similarity of the latter to *U. turcomanica* Tranzschel. He does not believe that the disease was introduced into the country from America with the seed, as several years have elapsed since the importation of the latter and the outbreak occurred suddenly in fields sown in August and September, 1925, with seed

of local production; he rather inclines to the view that the infection originated from native species of rye grass.

Among other fungus diseases attacking western rye grass in Western Siberia, the following are stated to be the most widespread and dangerous: *Puccinia graminis, Claviceps purpurea, Helminthosporium sorokinianum, Fusarium* spp., and to a lesser degree *Septoria* spp.

LINDEMANN (I. V.). К вопросу о борьбе со Свекловичным долгоносиком при помощи мюскардины. Предварительное сообщение. [On the question of the control of the Beet weevil by means of muscardine. (Preliminary report).]—*La Défense des Plantes*, Leningrad, iii, 4–5, pp. 404–414, 5 graphs, 1926.

A detailed description is given of experiments made in 1924 and 1925 at Smiela [Ukraine] with a view to testing the possibility of controlling the beet weevil *Cleonus* [*Bothynoderes*] *punctiventris* by inoculating the soil with green muscardine (*Penicillium* [*Metarrhizium*] *anisopliae*) and red muscardine (*Tarichium uvella*). Both organisms are stated to exist normally in the soil of beet fields, but while *M. anisopliae* is apparently capable of living for a number of years saprophytically in the soil, *T. uvella* (briefly described from A. T. Speare's account in *Journ. Agric. Res.*, xix, 8, 1920) requires the presence of larvae of the insect for its continued existence. The results indicated that natural infection is approximately doubled by such inoculations, but even with the highest doses did not reach over 60 per cent. for each of the organisms separately; only by combining the inoculations could a death rate of the larvae of 90 per cent. and over be attained. Further work on the question is in progress.

BROADFOOT (W. C.). **Studies on the parasitism of Fusarium lini Bolley.**—*Phytopath.*, xvi, 12, pp. 951–978, 2 figs., 1 graph, 1926.

In this paper the author presents evidence that physiologic specialization exists in *Fusarium lini*, the cause of wilt disease of flax (*Linum usitatissimum*) [*R.A.M.*, v, p. 490]. At least nine, and possibly more forms have now been distinguished by their parasitism on four varieties of flax. Seven of the forms differed greatly in virulence. Forms 1 and 2 were equally virulent, but form 1 differed from all the others in causing a complete chlorosis of all host tissues above the cotyledons, the line of demarcation between normal and chlorotic tissues being sharply defined. This condition was produced by artificial inoculations of young plants, 4 to 6 inches high, in the field as well as in greenhouse experiments. The same strain also caused a similar loss of colour in certain varieties of barley, oats, and rye. Variations in the morphology of spores of identical forms were found to exist under different conditions of growth, but cultures of nine forms on slightly acid peptone agar under identical treatment varied from a mean length of $20{\cdot}10 \pm {\cdot}33\ \mu$ for form 7 to $35{\cdot}95 \pm {\cdot}42\ \mu$ for form 5. Some of these differences of spore size (100 spores being measured in each case) between the forms were significant while others were not; hence spore size is not an accurate criterion for separating the forms into

morphological categories, though the results indicate that there are inherent differences in spore dimensions of different forms when cultured under identical conditions. Similarly, no significant differences were found in the amount of radial growth of four forms on the same medium at various temperatures. The nine forms could, however, be differentiated macroscopically, though with difficulty, by the following cultural characters: colour of the mycelium and substratum, mycelial characters, sporulation, and rate of radial growth.

The minimum time required for spore germination in distilled water at 20° to 21° C. was found to be 2 hours 5 minutes for one culture and 1 hour 45 minutes when flax tissue was added, and similar results were obtained in other cases. Germination took place between 7° and 35°, the optimum temperatures being from 12° to 30°. Taxonomically *F. lini* is considered to belong to the Elegans section of the genus *Fusarium*.

LETCHER (H.) & WILLAMAN (J. J.). **Biochemistry of plant diseases VIII. Alcoholic fermentation of Fusarium lini.**—*Phytopath.*, xvi, 12, pp. 941–949, 3 graphs, 1926.

In continuation of the work of Anderson on the biochemistry of *Fusarium lini* [*R.A.M.*, v, p. 441] the cause of the wilt disease of flax, the authors record the results of their investigation of alcohol production by this organism. The cultures studied were those referred to in the preceding abstract, and the media used included salt peptone solution containing 8 and 12 per cent. sucrose, maltose syrup, maize syrup, inorganic salt medium containing 8 and 12 per cent. glucose, molasses, and beerwort. The alcohol was distilled off and determined by the specific gravity method.

The fungus (forms 2 and 7) produced appreciable amounts of ethyl alcohol on all the media, but a maximum was not attained until 20 days or more and was usually followed by a decrease. Form 2 yielded more alcohol than form 7. The amount of alcohol produced by eight forms of the fungus on molasses ranged from 0·80 to 2·99 per cent. by volume 30 days after inoculation, while the highest percentage for any single culture was 3·7. The two forms of *F. lini* which were least virulent in their attacks on the host plant showed the lowest alcohol production, indicating a correlation between alcohol production and pathogenicity. Acetaldehyde was found to be one of the intermediate products formed by the organism in fermenting sugars. At any given time, however, only traces of this substance were found.

SERRANO (F. B.). **Deterioration of Abacá (Manila Hemp) fibre through mold action.**—*Philipp. Journ. of Sci.*, xxxii, 1, pp. 75–101, 10 pl., 2 graphs, 1927.

The present work determines the part played by fungi in the deterioration of abacá (Manila hemp) [*Musa textilis*] fibre, complaints against which have been received from all localities of the Philippines since 1920. Defective fibre is characterized by weakness, brittleness, sometimes a dull, dark, dirty colour, and a musty odour which is more pronounced in moist than in dry fibre. A number of fungi were isolated from deteriorated abacá. These

were inoculated into sterile pieces of fibre, and after an incubation period of about two months, the resultant deterioration as measured by reduction of tensile strength and elasticity was determined. The organisms causing the greatest amount of deterioration were of the cellulose-digesting type: *Aspergillus flavus, A. fumigatus, A. glaucus, A. niger, A. wentii, Penicillium glaucum, Chaetomium elatum, C. funicolum, C. olivaceum,* and *C. olivaceum* var. *chartarum*; these fungi were capable of causing deterioration only when the fibres were moist. Coarse or partially cleaned fibre suffered more when inoculated with *Aspergillus fumigatus* than fine fibre, and a tendency for outer fibres to deteriorate more quickly than inner ones was noticed. Bunchy top and heart rot caused a weakness in fibre due to an improper development of the latter under diseased conditions. Records made of the temperature and humidity in warehouses showed that the conditions were decidedly favourable for the development of fungi, and it was determined that deterioration could not be attributed to occasional wetting with salt water in transit. A histological comparison of sound and unsound fibres showed in the latter a disorganization of the tissues not observed in the former; and fungal infection in 80 per cent. of the latter as compared with 5 per cent. of the former.

The only possible control methods are based on the adoption of measures to reduce the liability of the fibre to attacks by the ubiquitous cellulose-destroying organisms. All fibre should be dried to a moisture content of 11 or 12 per cent. before baling and storing. It should not be stored in warm atmospheres for long periods. Warehouses should be adequately ventilated, and care should be taken in handling.

CORBETT (W.). **A wilt disease of the Carnation.**—*Gard. Chron.*, lxxxi, 2096, p. 150, 1927.

In this paper a preliminary account is given of an apparently new disease of carnations received at the Cheshunt Research Station in 1926. The plants, which were about four months from the cutting stage, showed signs of wilting and were of stunted appearance. Both the pith and wood of the wilted stems were diseased, the wood being brown at the base and for some distance up the stem, infection most probably having taken place at soil level. Two fungi were isolated from the diseased material, one of which, probably a species of *Alternaria*, proved to be pathogenic. Young shoots of healthy carnation plants inoculated in December or in January wilted completely in 36 days and 12 days respectively, but older stems took as much as 61 days to wilt entirely. Stunting of the younger shoots was also produced after a comparatively short period. Plants sprayed with a spore suspension of the fungus and kept in a humid atmosphere for two days produced pale, circular, discoloured areas with black centres on the younger leaves and stems closely resembling those caused by *A. dianthi* S. & H. The organism differs, however, from the latter by its normal mode of infection and in the broader shape of the spores, which measure 26 to 100 by 13 to 38 μ. The optimum temperature for the fungus appears to lie between 73° and 77° F.

KUNKEL (L. O.). **Studies on Aster yellows.**—*Amer. Journ. of Botany*, xiii, 10, pp. 646–705, 5 pl., 4 figs., 1926.

This paper contains a comprehensive account of the yellows disease of china aster (*Callistephus chinensis*) [*R.A.M.*, v, pp. 36, 81].

The disease was shown to be transmitted by the leafhopper (*Cicadula sex-notata*) while other aster insects tested gave negative results in each case. Of mechanical methods of transmission tried, budding was the only one which proved successful. By means of the leafhopper the disease was transmitted to more than 50 species in 23 different families of plants. In the same way it was carried back to the aster from many of these different hosts, most of which are cultivated flowering plants; the disease has not yet been transmitted to any crop of great economic importance.

It was found that the disease is very rarely, if ever, transmitted through aster seeds. Chlorotic seedlings occasionally appeared, but died within a few weeks. Transmission does not take place through the eggs of the insect carrier, nor does it occur from plant to plant or from insect to insect by contact. Insects were found to carry the virus for more than 100 days. Experiments showed that the disease could be transmitted through old or young leaves, and further, that transmission through the latter produces systemic infection, while through the former a one-sided infection sometimes occurs.

As a result of extensive tests it was found that an incubation period of at least ten days must elapse before the insects become inoculative [*R.A.M.*, v, p. 430]; in adults this incubation period is shorter than in nymphs. An insect is capable of retaining the virus as long as it lives, but some seem to lose it after a time.

Aster yellows was proved by experiment to be identical with white heart disease of lettuce, with a previously undescribed disease of buckwheat [*Fagopyrum esculentum*], and with several yellows diseases of cultivated garden plants. It is similar to, but apparently distinct from peach yellows [*R.A.M.*, iv, p. 294], strawberry yellows [*R.A.M.*, v, p. 235], curly top of beets, and false blossom of the cranberry [*Vaccinium macrocarpon*: *R.A.M.*, iv, p. 490]. It is distinct from stunt disease of dahlia [*R.A.M.*, vi, p. 215].

Overwintering of the virus occurs in biennial and perennial host plants, some of them belonging to the genera *Chrysanthemum*, *Sonchus*, *Asclepias*, *Erigeron*, and *Plantago*.

S[CHENK] (P. J.). **Rhizoctonia solani aan Orchideeën.** [*Rhizoctonia solani* on Orchids.]—*Floralia*, xlvii, 48, p. 761, 1 fig., 1926.

A brief account is given of a disease of the orchid *Oncidium grande* caused by *Rhizoctonia solani*, which forms a conspicuous brown mycelium on the leaves as well as on the roots of potted plants. The fungus is believed to have been present in the soil, on which potatoes had previously been cultivated. This is thought to be the first record of *R. solani* on the orchid in Holland.

S[CHENK] (P. J.). **Plagen van Chrysanten.** [Pests of Chrysanthemums.]—*Floralia*, xlvii, 48, pp. 754–755, 2 figs., 1926.

Brief notes are given on the following fungous diseases of

chrysanthemums occurring in Holland. *Septoria chrysanthemi* produces on the leaves circular, dark brown spots which subsequently fall out, giving a shot hole appearance. *S. chrysanthemella* forms round, dark spots, 0·5 to 2 cm. in diameter, on the upper side of which the fungus is visible. *Puccinia chrysanthemi* produces chocolate-coloured spores on the under side of the leaves and brown spots on the upper side. The application of 1 per cent. Bordeaux mixture is recommended for the control of this disease. *Oidium chrysanthemi* attacks the leaves, stalks, and flower-buds, chiefly of rankly growing plants. This type of growth may be modified by fertilization with potash in preference to nitrogen compounds. Infected plants should be dusted with sulphur during sunny weather.

ZOPPIG (F.). **Efeukrebs.** [Ivy canker.]—*Die Kranke Pflanze*, iv, 2, p. 32, 1927.

A heavy outbreak is recorded during the summer of 1926 in the chief cemetery in Stettin of a leaf disease of the ivy (*Hedera helix*) locally known under the name of canker, and caused by an undetermined bacterium. The outbreak was apparently favoured by the exceptionally heavy rainfall during that year. The symptoms were small brown spots with red margins, which almost entirely covered the old leaves, but were much less numerous on the younger. In an editorial footnote the disease is stated to have already been recorded in other places, but that the symptoms usually disappeared at the onset of dry weather.

BARILI (P.). **I trattamenti invernali ai fruttiferi.** [Winter treatment of fruit trees.]—*Il Coltivatore*, lxxiii, 3, pp. 79–80, 1927.

The scope of the present brief notice is to urge Italian fruit growers to subject their fruit trees to winter treatment for the control of insect pests and parasitic fungi. Among the latter the most prevalent, especially in Tuscany, are stated to be *Exoascus* [*Taphrina*] *deformans* and gummosis of the peach, canker of the apple (*Nectria ditissima*) [*N. galligena*], and pear scab (*Venturia pirina*).

BARSS (H. P.). **How to follow spray calender.**—*Better Fruit*, xxi, 8, pp. 14–15, 24–26, 1927.

In this paper practical notes on the control of fungous and insect pests of fruit trees in Oregon are given in some detail, together with a complete spraying calendar for pests and diseases of (1) apples and pears, (2) prunes and plums, (3) peaches, (4) cherries, and (5) apricots. It is noted that lime-sulphur sprays must be replaced by a non-caustic sulphur spray or by sulphur dust for tender-skinned pears such as d'Anjou and Comice, to avoid russeting. Sulphur dust applied in warm weather is also recommended against powdery mildew [*Podosphaera leucotricha* and *P. oxyacanthae*] which is often serious on Jonathan, Grimes, and Rome apples and d'Anjou and other varieties of pears.

KEITT (G. W.) & JONES (L. K.). **Studies of the epidemiology and control of Apple scab.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 73, 104 pp., 16 pl., 2 figs., 7 graphs, 1926.

As the four-spray schedule for the control of apple scab (*Venturia inaequalis*) in general use in the north-central and north-eastern United States failed to give consistently satisfactory results in Wisconsin, investigations were begun in 1919, comprising both field studies in relation to the natural environment, and laboratory and greenhouse studies in which certain factors of the environment were varied under control [*R.A.M.*, v, p. 495]. Graphic summaries of the seasonal field data on the development of the host, parasite, and disease in correlation with meteorological records are presented for the six years 1919 to 1924. In agreement with observations of other investigators these data show that the moisture and temperature factors play a leading part in determining the severity of the disease. Longevity studies showed that freshly ejected ascospores, in distilled water, germinated approximately to 100 per cent., while perithecia collected in May and stored at 10° C. and a relative humidity near 60 per cent. until November, discharged spores when wetted which gave a germination of 90 per cent. Ascospores kept air-dry at 20° to 27° showed 10 per cent. germination at the end of a month. In seven years no drought has been encountered of sufficient duration in Wisconsin to limit the viability of mature spores contained in asci.

Fresh conidia possess a high degree of viability, and were found able to survive the winter on leaves under shelter in the open. Ascospores and conidia allowed to lie in drops of water in contact with hard surfaces adhered to the substratum and resisted washing off, and germ-tubes developed in close contact with a firm substratum were closely adherent throughout their length. While direct penetration of the leaf cuticle by infection hyphae from normal appressoria was commonly observed, short, thick germ-tubes were also found to function as appressoria, and infection hyphae frequently developed direct from ascospores.

Infection occurred at temperatures ranging from 6° to 26°, the optimum for development of disease being near 20°; ascospores and conidia were able to germinate from 0·5° to 32°. The minimum periods of continuous wetting necessary for infection of apple leaves were found to be: at 6°, 13 to 18 hours; 9°, 9 to 11 hours; 15°, not more than 8·5 hours; 20°, 4 to 6 hours; 24°, 4 to 6 hours; and 26°, 8 to 10 hours. Abundant infections occurred following suitable periods of intermittent wetting, and variations of the relative humidity from 50 to 90 per cent. at 20° during the incubation period showed no effect on the development of the disease.

Under Wisconsin conditions the fungus was found to overwinter to a significant extent only by means of perithecia in dead leaves, and discharge of ascospores, which took place only when the leaves were wet, continued over a period varying from 5 to 9 weeks. In 1924 the maximum concentration of ascospores was 289 per cubic foot of orchard air during a five-hour period on 13th May, when the fruit buds were in the green-tip stage. The apical portions of sepals and leaves are the first susceptible host parts exposed, and early sepal infection, which was frequently observed, put the fungus

in a favourable position for secondary infections by means of water-borne conidia. Production of conidia usually begins before the lesions are macroscopically visible, and observations in the field showed that an abundant source of secondary inoculum was never wanting on unsprayed trees after infection was once well established. The most critical period for the development of scab epidemics extends from the time when the tips of the sepals are first exposed until some 2 to 4 weeks after petal-fall, more particularly the period prior to the open cluster stage of bud development. A second critical period occurs in autumn, when cool moist weather may permit serious late infections of fruit and leaves.

Spraying experiments, carried out with various fungicides on a number of varieties at several orchards, showed that commercial lime-sulphur (1–40) gave the best control of scab and least fruit injury, but Bordeaux mixture, although giving good control of scab, was not commercially satisfactory owing to serious fruit russeting and foliage injury. The addition of spreaders (glue, gelatine, and casein-lime) did not increase the effectiveness of the spray fluids. In 1922 and 1923 all the dusts gave fair to good control of scab, but in 1924 the results were less favourable; the data on dusting are not considered conclusive, and investigations are being continued. A six-spray schedule with lime-sulphur is recommended for use under epidemic conditions in Wisconsin.

A bibliography of 77 titles is appended.

SWARBRICK (T.). **The healing of wounds in woody stems. II. Contributions to the physiological anatomy of ringed Apple shoots.**—*Journ. Pomol. and Hort. Science,* vi, 1, pp. 29–46, 3 pl., 1927.

The writer in this paper continues his histological study of the process of natural healing of artificial wounds [*R.A.M.*, v, p. 503], extending it to cases of ringing of two-year-old branches of apple trees where the cortex and phloem only are removed. No callus production took place in uncovered rings before 5th June, which date was found to be correlated with the beginning of starch redeposition and the attainment of the full leaf stage of the tree. Callus developed most rapidly in the second half of June and the first half of July. When the rings were covered with adhesive plaster the rate of callus production was greatly accelerated as compared with uncovered rings. After 16th June the covered rings developed callus from both upper and lower edges, whereas previous to this date it developed only from the upper edge. In the case of uncovered rings, no callus was produced from the lower edge of the ring.

WINGARD (S. A.). **Black end of Apple.**—*Phytopath.*, xvi, 12, pp. 1011–1012, 1 fig., 1926.

The writer reports a fairly high percentage of apples on two trees at Grady, Montgomery County, Alabama, affected in 1925 with the malady described by Barss as 'black end' (*Third Crop Pest Rept. Oregon Exper. Stat.*, pp. 159–166, 1921), a disease uncommon in the Southern States. Affected fruits show a black discoloration of the skin about 2·5 cm. in diameter, surrounding the calyx end of

the fruit, and as the fruit grows a crack is formed along the margin of this area. The cause of the trouble is attributed to the long drought from February to October, 1925, the effect of which was no doubt intensified by the red clay soil of the orchard in question.

PLAGGE (H. H.). **Prevention of storage disorders in Apples.**—*Amer. Fruit Grower*, xlvi, 10, pp. 3, 18, 2 figs., 1926.

A full account is given in popular terms of apple scald, soft scald [*R.A.M.*, v, p. 676], and Jonathan spot [*R.A.M.*, iv, p. 676] and their control. The difficulty of controlling both Jonathan spot and soft scald, which are particularly common on Jonathan apples, is noted, as immediate storage controls the former and delayed storage the latter. The author suggests that where soft scald is likely to develop, precautions might be taken particularly against this disease, as when severe it is more detrimental to the fruit than Jonathan spot.

PLAGGE (H. H.), MANEY (T. J.), & GERHARDT (F.). **Certain physical and chemical changes of Grimes Apples during ripening and storage period.**—*Iowa Agric. Exper. Stat. Res. Bull.* 91, 72 pp., 1 col. pl., 3 figs., 8 graphs, 1926.

In this paper, which deals chiefly with the various changes in Grimes apples incident to ripening and storage, the results are included of experiments on the development of apple scald and internal breakdown.

The apples were stored under the same conditions as those obtaining in earlier experiments [*R.A.M.*, iv, p. 676], i. e., at 32° F. and at 85 to 87 per cent. humidity. The amount of scald developing immediately after removal from storage and at periods of one week and two weeks after removal was recorded.

The data, which are given in tabular form, show that fruit picked when very mature did not scald under any of the conditions noted. Wrapping apples in oiled paper entirely prevented scald, none appearing even after the wraps were removed.

Apples wrapped in plain paper until removed from cold store and then unwrapped and smeared with oil before any scald had appeared soon developed it on exposure to ordinary temperatures, indicating that the oil is only effective if present early in the storage period. Delayed storage increased the amount of scald in some cases and decreased it in others.

Similar tests with internal breakdown of apples gave conflicting results, there appearing to be little correlation between this trouble and maturity of the fruit, while oiled papers gave no control.

Considerable differences in hardness were evident in the various lots of apples at the time of storing, and these differences evidently affected the development of scald. The fruit stored in softer condition due to delay at the orchard was less subject to scald than that stored immediately after picking while still hard.

NIXON (E. L.). **Fire blight.**—*Pennsylvania Agric. Exper. Stat. Bull.* 203, 22 pp., 16 figs., 1926.

In this popular account of the fireblight disease of pome fruits

caused by *Bacillus amylovorus*, the author includes a description of the migration and transformation of the organism within the cortical tissue of the twigs, an account of which has already been noticed [*R.A.M.*, v, p. 432], and finally recommends the following control measures against the disease: (1) promotion of restricted growth, since excessive growth renders the trees more susceptible to the disease; the use of nitrate of soda or sulphate of ammonia is preferable to farmyard manure as a source of nitrogen, for these promote a shorter growth period, and once the terminal buds are formed, the twigs are no longer susceptible to infection; (2) removal of 'holdover' cankers during the dormant season only; and (3) avoidance of all crab apple varieties (and also white thorn or *Crataegus* species) as root stocks, since all varieties examined have shown the encysted condition [loc. cit.] caused by fireblight infection. It is impracticable to cut out root blight, even in the dormant season, since its presence is detected only by the effect on the aerial parts of the tree. The author believes that the ultimate solution of the fireblight problem lies in a discovery of immune or resistant varieties, search for which is already being carried out.

S[CHENK] (P. J.). **Perenschurft voorkomen.** [Prevention of Pear scab.]—*Floralia*, xlvii, 45, pp. 712–713, 2 figs., 1926.

A short account is given of the successful control of pear scab [*Venturia pirina*] at Baarn (Holland) by two applications of 1 per cent. Bordeaux mixture, given in the middle of May and the beginning of August, respectively. The Louise Bonne d'Avranches and Beurré Clairgeau varieties were specially benefited by the treatment. The writer recommends the application, shortly before the opening of the buds, of 1·5 per cent. Bordeaux mixture or 3 per cent. lime-sulphur, followed by a second application of 1 per cent. Bordeaux mixture plus 0·1 per cent. Paris green or 0·5 per cent. lead arsenate soon after the setting of the fruit. Susceptible varieties should be given a third application of 1 per cent. Bordeaux mixture three or four weeks later.

te S. (M.). **De bladvlekkenziekte der Aalbessen.** [The leaf spot disease of Currants.]—*Floralia*, xlvii, 45, p. 713, 1 fig., 1926.

During the wet summer of 1926, red and white currants were extensively affected in Holland by the leaf spot disease due to *Gloeosporium ribis*. By the early part of September the majority of the bushes under the writer's observation were completely defoliated. Thorough draining is considered to be the only promising control measure against this disease.

BAIN (H. F.). **Cranberry disease investigations on the Pacific coast.**—*U. S. Dept. of Agric. Bull.* 1434, 27 pp., 1926.

This bulletin summarizes the results of a four-year study of cranberry (*Vaccinium macrocarpon*) diseases in the States of Oregon and Washington, where cranberry cultivation has only been developed extensively since 1912. Red leaf spot caused by *Exobasidium vaccini* is said to be frequently followed by the black spot fungus [not specified] (which also occurs on the fruit), in which case the infected leaves are entirely killed, shrivel rapidly,

and drop off easily, a result which *Exobasidium* does not cause when acting alone. These fungi are very dependent on weather conditions, and the disease is rarely severe enough to warrant spray treatment.

Rose bloom (*E. oxycocci*) occurs occasionally, and no control measures have been found necessary.

False blossom [*R.A.M.*, v, p. 565] occurs very commonly on Wisconsin vines, but not on the Cape Cod or New Jersey varieties. The disease can be easily located in newly planted bogs at the end of the second growing season by the upright, witches' broom-like appearance of the affected plants. A year or two later, the affected vines are inconspicuous, and cuttings from such bogs will obviously spread the disease in some measure. The disease does not appear to influence the yield appreciably.

Rust (*Pucciniastrum myrtilli*), *Venturia* leaf spot [*V. compacta*], and *Sclerotinia* tip blight (*S. oxycocci*) also attack the leaves, but do not cause much damage. The last-named fungus, however, also causes hard rot (or cotton ball) of the berries, and though not general, occasionally becomes epidemic. At harvest time the berries fail to ripen normally, and yellowish-brown areas appear, which rapidly spread until the whole berry is uniformly affected. The interior is filled with the cottony white mycelium of the fungus. The apothecia which mature in April or early in May arise from sclerotia, and are more freely developed from sclerotia occurring on fallen leaves than from those on rotten berries. No symptoms of infection are visible until the sudden wilting of the upright shoots about the time the plants are coming into bloom. The affected shoots collapse a short distance from their tips, and the dead stems and other organs attacked soon become covered with masses of conidia. These are developed at the blossoming period, and serve to bring about the infection of the berries, which continue their normal growth during the summer. Clean picking is recommended as an important control measure against this disease.

Species of *Botrytis* and *Phomopsis* and *E. vaccinii* are also noted as causing minor rots of the berries in the field. By far the greatest loss is caused, however, by storage rots. A number of fungi produce symptoms so nearly alike that it is practically impossible to identify them by inspection alone; they are also similar in that they infect the berries before harvest [*R.A.M.*, iii, p. 526]. Control experiments are described, which extended over the years 1922-5, and gave the following results. The percentage of rot developing in 1922 in berries of the Howes variety from a bog sprayed regularly with Bordeaux mixture and from one untreated was 13 and 52, respectively. In the same year applications of Bordeaux mixture to a plot previously left unsprayed reduced the percentage rot of berries in storage from 38·1 to 30.

Further experiments in 1923 showed that three sprayings with Bordeaux mixture reduced rots from 73 to 36 per cent. and from 52 to 20 per cent. in the Searls and Howes varieties, respectively. Trials to determine the best number and times of application of the spray showed that two sprays, one at the 'hook' stage or just as flowering commences, and a second after blossoming gave the best

results; further tests made in 1924 and 1925 confirmed this conclusion. Dusting experiments did not give as good control as spraying, and cold storage at 32° to 34° F. failed to prevent the development of rots, which were also favoured by wet weather at picking time.

More than 3,200 cultures from individual rotted berries were made, and many organisms obtained, of which the most important was end rot (*Fusicoccum putrefaciens*) which appeared in more than 60 per cent. of the cultures showing fungus growth, then in order *Phomopsis* sp., *Penicillium* sp., *Sporonema oxycocci*, and *Ceuthospora lunata*. Practically all fungi known to rot cranberries elsewhere were found in the cultures. The results of 1,000 cultures from green berries showed that infection by storage rot fungi takes place during or immediately following the blossoming period, and usually at the blossom end of the berry.

De Mel (C. N. E. J.). **Notes on some pests and diseases of Plantains and Tobacco in the North-Western Division.**—*Year-Book Dept. of Agric., Ceylon, 1927*, p. 30, 1927.

The author reports a set-back in plantain [*Musa paradisiaca*] cultivation in Ceylon, due to the bunchy top disease [*R.A.M.*, v, p. 373], which is still prevalent, though it is said to be apparently on the decline in the north-western division. A wingless aphis was found on affected plants, and it is thought that it may help in the spread of the disease [ibid., vi, p. 174]. Avoidance of suspected material for planting and the destruction of affected plants are the only known methods of control.

An anthracnose due to *Gloeosporium musarum* is reported occasionally causing a blackening and withering of the fruit. A diseased condition of plantains first reported by Gadd is characterized by a yellowing of the leaves and blackening of the fruit. This disease, which was considered to be probably due to a species of *Rhizoctonia* isolated from the roots, has so far only been observed at Gokarella, the locality from which it was originally recorded.

R. bataticola was suspected of causing damage to tobacco in a field where it had caused death to chillies [*Capsicum annuum*] interplanted with the tobacco.

Chetlain (J. F.) & Overley (F. L.). **Stationary spray plant serves 80 acres.**—*Better Fruit*, xxi, 8, pp. 13, 28 and 30, 1 fig. (p. 12), 1 diag., 1927.

In this article the installation of a stationary spray plant to serve an 80-acre orchard in north-western United States is described in some detail.

The size of pipe used to convey the spraying fluid is stated to be of great importance, owing to loss of pressure due to friction. A table is given showing the loss in lb. pressure per square inch for 100 ft. of pipe of varying diameters. With a flow of 25 gallons per minute, a ¾ inch pipe caused a loss in pressure of 78 lbs., a 1 inch pipe of 19 lbs., a 1¼ inch of 6·40 lbs., and 1½ inch of only 2·62 lbs. A diagram of the orchard is given showing the position of the electric power station and the arrangement of the pipes. Branches are given off from the main at intervals of seven trees,

with hydrants located along them at every fourth tree. The total cost of installation for this orchard is estimated at approximately $4,400.

MOSES (B. D.), DURUZ (W. P.) & WOOD (T. A.). **Stationary spray plants in California. (A progress report.)**—*California Agric. Exper. Stat. Bull.* 406, 29 pp., 12 figs., 2 diags., 1926.

This bulletin gives a comprehensive account of investigations carried out on the efficiency of stationary spraying plants, which since 1908 have been gradually coming into use in Californian orchards.

The system consists of a central pumping station and underground pipe lines laid systematically throughout the orchard, with outlets at intervals, to which hoses are attached for spraying the trees. It is specially suitable for use in hillside orchards or orchards which are liable to become flooded in the spring. Other advantages maintained are that electric power can be used, cover crops and low-hanging branches are not damaged by tractors, irrigation and spraying may be carried on simultaneously, and the operating cost is low, with saving of time and labour. The chief disadvantages pointed out are the high initial cost, the dependence on one plant, the high pressure needed to overcome friction in the long pipes used, the possibility of damage to the pipe system during cultivation and the danger of corrosion and settling of materials in the pipes, though the last-named is minimized by proper flushing after each spraying.

The results of numerous field tests and observations are given in tabular form, from which it is deduced that the average cost of installation is about $37·50 per acre, and operating costs for a single application from $5·04 to $12·69 per acre or 0·7 to 3·7 cents. per gall. inclusive of all labour, material, power, and repairs.

Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenchutzdienstes. [List of fungicides and insecticides recommended by the German Plant Protection Service.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst,* vii, 2, pp. 19–24, 1927.

Of the fungicides included in the present list, in addition to others already noticed in previous lists [*R.A.M.*, v, p. 113], erysit (Chemische Fabrik auf Aktien vorm. E. Schering, Berlin N39), an insecticidal spray, is recommended for the control of rose mildew [*Sphaerotheca pannosa*] by repeated applications, and of chrysanthemum mildew [*Erysiphe cichoracearum*] by a single application.

ERIKSSON (J.). **Die Pilzkrankheiten der landwirtschaftlichen Kulturgewächse. I Theil. Zweite Auflage.** [Fungous diseases of agricultural plants. Part I. Second edition.]—viii + 300 pp., 3 col. pl., 151 figs., Stuttgart, Franckh'sche Verlagshandlung [1927.]

This handbook treats of the diseases of agricultural crops (diseases of fruit trees are not considered) grown in northern and central Europe. The author states that since the publication of the first edition in 1912 (an English translation appeared in the same year)

many new diseases have been recorded and those previously known have become better understood: a thorough revision of the text and many additions to it have in consequence been made. As in the earlier edition the arrangement of the subject-matter is based on the classification of the fungi, and a host index is appended. A new feature is a list of references to the more important literature which precedes a description of each disease. It is proposed to issue a second part of the handbook dealing with the fungous diseases of garden and ornamental plants, including those of the grape vine.

MASUI (K.). **The compound mycorrhiza of Quercus pausidentata Fr.**—*Mem. Coll. Sci. Kyoto Imper. Univ.*, Ser. B, ii, 4, pp. 161–187, 1 pl., 41 figs., 1926.

Two types of compound mycorrhiza of *Quercus pausidentata* (*Q. sessiliflora*) found near Tajimi, Japan, form the subject of this paper.

Form A is a spherical, ovoid, or clavate body, 4 to 15 mm. long, attached to the side or end of the root; it is pure white when young, but turns brownish with age. Microscopic examination of this structure showed that it consists of numerous mycorrhiza developing round an axial root and bound together with an enveloping mycelium, the latter consisting of two layers, an outer of loose narrow hyphae, and an inner of dense texture.

Each of the slender, branched mycorrhiza enclosed in the envelope is a branchlet of the axial root, and is composed of an outer fungus mantle, an epidermal layer, a cortical layer, and central cylinder. Besides these, rootlets heavily infected by the fungus are found. The development of this type of compound mycorrhiza from ectotrophic mycorrhiza on the apices of large vigorous roots is traced in detail. These vigorous roots give off branches one after the other in spiral acropetal order and each branch gives off branchlets until the total number is innumerable. When the tubercle becomes old the enveloping mycelium perishes, leaving the numerous mycorrhiza exposed.

Form B is a spheroidal or botryoidal body, 2 to 6 mm. in diameter, with a smooth surface from which hyphal bundles resembling rhizomorphs are given off. In internal structure it resembles form A except that it lacks the axial root. It develops from a side root round which hyphae begin to increase in number until a compact network is formed on its surface. The root ceases to grow in length but divides dichotomously and the structure increases in diameter. The branches subdivide again, and the whole continues to grow until a certain definite size is reached. A species of *Boletus* resembling *B. luteus* was found in actual contact with this form of mycorrhiza which it clearly produced. The hyphal bundles frequently found in connexion with the mycorrhiza are made up of numerous small hyphae, 2 to 3·5 μ in diameter, with certain very large hyphae, sometimes 15 μ in diameter, in the central region.

In conclusion, the author suggests the classification of compound mycorrhiza into (*a*) the dichotomously branched type to which form B belongs and (*b*) the monopodially branched type represented by form A.

MASUI (K.). **A study of the ectotrophic mycorrhiza of Alnus.**—*Mem. Coll. Sci. Kyoto Imper. Univ.*, Ser. B, ii, 4, pp. 189–209, 1 pl., 31 figs., 1926.

Six different kinds of mycorrhiza found by the author on species of *Alnus* in the vicinity of Kyoto, Japan, are described in this paper in some detail.

On *A. japonica* two types are reported. Form A is caused by a species of *Cortinarius* and is the first record in Japan of a member of this genus acting as a mycorrhizal fungus on *Alnus*. The mycorrhiza is pure white when fresh, and the numerous white hyphae given off from its surface grow densely together in the surrounding soil or leaves. The fungous mantle measures 60 to 90 μ in thickness and is differentiated into three layers. From the inner layer hyphae penetrate inwards, firstly between the epidermal cells and then into the cortical cells themselves, appearing very much like endotrophic mycorrhiza. In late August numerous primordia of the basidiocarp are formed as minute knots of mycelium and these attain full maturity in one or two weeks.

Form B is whitish when young, changing to a brownish colour with age, and is easily distinguishable by its slender, irregularly bent form. Rhizomorph-like hyphal bundles which are given off from its surface elongate along the mother root or in any other direction, and on coming in contact with a young rootlet, expand all over its surface until a new mantle is formed.

On *A. firma* var. *sieboldiana* three types of ectotrophic mycorrhiza are described; form A is white in colour, with a smooth surface, rarely giving off hyphal bundles; form B is yellow, with a rough surface, giving off numerous hyphal bundles; while form C is dark in colour and provided with long dark setae on its surface. Combinations of these forms were occasionally observed.

On *A. pirina* var. *multinervis* yet another type of mycorrhiza is reported. This form is yellowish in colour, becoming brown with age. The surface is rather smooth, with short filaments sparsely projecting from it, while long rhizomorph-like hyphal bundles are found connected intimately with it.

LESZCZENKO (P.). **Wpływ odczynu środowiska na kiełkowanie zarodników Verticillium alboatrum R. et B. i Ustilago maydis Tul.** [On the influence of reaction of the medium on the germination of the spores of *Verticillium albo-atrum* R. et B. and *Ustilago maydis* Tul.]—Reprinted from *Mém. Inst. Nat. Polonais d'Econ. Rur. à Puławy*, vii, part A, pp. 402–435, 1926. [English summary.]

A detailed description is given of experiments made by the author to test the action of various dilutions of nitric, muriatic, sulphuric, ortho-phosphoric, oxalic, acetic, and citric acids, and of their potassium salts on the germination of the spores of *Verticillium albo-atrum* and *Ustilago maydis* [*U. zeae*]. The conidia from one-month-old cultures of *V. albo-atrum* on sterilized pieces of pea stems were germinated in hanging drops in moist van Tieghem cells, and the chlamydospores of *U. zeae*, which had been kept in the laboratory for a period from six to twelve months after collection, were germinated on the surface of the liquids tested. The

germination of the spores was studied (1) in distilled water solutions of the acids and salts without the addition of any nutrient, (2) in similar solutions to which 0·1 per cent. peptone and 0·1 per cent. grape sugar had been added, (3) by steeping the spores for 12 hours in the acid solutions and then germinating them on blotting-paper wetted with the nutrient, all the observations being continued for 48 hours.

The results showed that all the acids tested at low concentrations stimulated the germination of the spores; this acceleration is attributed to the action of the hydrogen ion, and, in some cases, is thought to be connected with the absorption by the germinating spores of nutritive materials from the acids. As the concentration of the acids increased, so also did their injurious effect on germination, but this effect was not so marked when the nutrient was added to the solutions. The injury was also less when the spores were steeped in the acids and then germinated on blotting-paper. The results of experiments to test the combined effect of the acids and salts, when mixed together, on the germination of *U. zeae* only, indicated that the injurious action of such combinations depends on the action of neutral salts combined with the action of hydrogen ions; it further depends on the degree of the dissociation of the molecules and on the concentration of ions in the solutions, and bears no relation to the undissociated molecules.

Finally the author investigated the influence of aqueous solutions of sodium, potassium, and ammonium hydroxides on spores of *U. zeae*. These alkalies were found to stimulate germination in comparison with distilled water, and this acceleration is ascribed to the hydroxyl ion which dissolves certain elements of the cell membranes and increases their permeability to the solutions. The presence of the hydroxyl ion was also found to increase the injurious effect of neutral salts.

KNIEP (H.). **Über Artkreuzungen bei Brandpilzen.** [On crosses between species of smuts.]—*Zeitschr. für Pilzkunde*, (N.S.), v, 14–15, pp. 217–247, 25 figs., 1926.

After reviewing his earlier observations and those of Bauch [*R.A.M.*, iv, p. 499] and Zillig [*Centralbl. f. Bakt.*, Ab 2, liii, p. 33, 1921] on the distinction of sex in the sporidia of species of *Ustilago*, and of the fusion between biologic forms of *U. violacea*, the author describes his investigations of the occurrence of fusions between different species of this genus. The structure of the external membrane of the spores is regarded by the author as an important indication of relationship; species with reticulate membranes are opposed to those with smooth or slightly punctate ones.

The following species with reticulate spores, viz., *U. violacea*, *U. scabiosae*, *U. utriculosa*, *U. cardui*, *U. vinosa*, *U. tragopogonis*, and *U. anomala* were tested and found to react with five specialized forms of *U. violacea* in each case. In one case a fusion of 11 sporidia was observed, and fusions of 3 to 6 sporidia were common.

In certain cultures of *U. tragopogonis* fusion was found to take place with B sporidia of other species but never with A sporidia, and the author concludes that he had unconsciously selected the sex A from the sex B. A similar phenomenon was observed on *U.*

violacea dianthi deltoides grown on albuminoid media, when the development of the B sex was suppressed. A case is also described in which the A sex of *U. anomala* was suppressed.

The author obtained numerous fusions between *U. tragopogonis* A, *U. utriculosa* B, and *U. cardui* B, and a sporidium of the first-named is figured showing fusion at one end with *U. utriculosa* and at the other with *U. cardui*. Sometimes one sporidium of *U. tragopogonis* fused with 2, 3, or even 4 sporidia of *U. utriculosa*. In further experiments with *U. anomala* added, fusion between the four species was obtained.

Experiments are also described with the following species with smooth chlamydospores—*U. longissima* and its var. *macrocarpa*, *U. grandis*, *U. bromivora*, *U. hordei*, *U. perennans*, *U. nuda*, and *U. tritici*. The first named has three sex forms, A, B, and C [*R.A.M.*, iii, p. 101], each of which fused with the other two. The A sex of *U. bromivora*, *U. hordei*, and *U. perennans* each reacted with *U. longissima* A and B but not with C, and the B sex with A and C but not with B. Three triple hybrids and the following combinations were developed, viz., between *U. longissima*, *U. hordei*, and *U. perennans*, and between *U. longissima*, *U. bromivora*, and *U. perennans*. Attempts to obtain fusion between species with reticulate and those with smooth chlamydospores failed in every case.

In experiments with *U. hordei*, which produces no sporidia in distilled water, the four promycelial cells generally conjugate in pairs, and the author concludes that two of the cells belong to the sex A and two to B. The species *U. nuda* and *U. tritici*, which do not form sporidia, were successfully crossed with *U. hordei* and *U. bromivora*, conjugation being effected between the promycelial cells of the former and the sporidia of the latter. In this way the author was able to determine the sex of the promycelial cells of *U. nuda* and *U. tritici* and to ascertain that the hybrid of *U. nuda* × *U. tritici* is a mictohaplont, the promycelium of which consists of two genotypical cells of different sexes.

DICKINSON (S.). **Experiments on the physiology and genetics of the smut fungi—hyphal-fusion.**—*Proc. Roy. Soc.*, Ser. B, ci, B. 708, pp. 126–136, 1 pl., 3 figs., 1927.

Following a brief review of the work of Kniep [see preceding abstract] and Bauch [*R.A.M.*, iv, p. 499] the author describes certain phenomena characterizing hyphal fusions in the covered smuts of oats (*Ustilago levis*) and of barley (*U. hordei*).

Chlamydospores were germinated on 1 per cent. beef extract agar films on cover slips, and as soon as each segment of the promycelium had produced a sporidium, each of the four sporidia was isolated in turn by the Dickinson isolator [*R.A.M.*, v, p. 377] and transferred to a beef agar slope. The mycelia which develop from the isolated sporidia consist of secondary sporidia (or conidia) and hyphae; the conidia multiply by budding or give rise to hyphae which grow at their apices, cutting off behind them cells which may or may not have contents, those with contents producing conidia or new hyphae. When two mycelia, each originating from a single sporidium meet, the hyphae either grow past each other

indifferently or curve towards each other in a definite manner suggestive of chemotropic stimulation; on coming in contact they swell and the contents of the one pass completely into the other, the resulting cell being termed a 'fusion hypha'. Isolations of sporidia from 82 promycelia were made and it was found that two of the sporidia of each promycelium were of one gender—A, and two were of another gender—B. The fusion hyphae in old cultures remain inactive, but when moved by the isolator to a fresh part of the agar medium, and in young cultures, they may either form, like the original hyphae, cells with or without contents which die after a few days or cease to develop further; or conidia and hyphae may develop at one or both ends and eventually produce a new mycelium. Conidia and hyphae isolated from one end of a fusion hypha were found to be of one gender, while those isolated from the opposite end were of a different gender, and fusions occurred when they were brought together. Fusion hyphae when isolated and transferred to medium in tubes and sub-cultured, gave rise to mycelia of one gender except in two instances; in one of these (No. 5) the reactions of individual hyphae were either A or B and single sporidia behaved similarly; in the second exception the upper part of the mycelium on the slopes was white and dry and composed of hyphae of A gender while the growth on the lower part of the slopes, which was brown, slimy, and mainly sporidial, was of B gender. As in most instances the mycelia from isolated fusion hyphae are wholly of one gender, this would appear to be due to a differential growth rate or to inactivation of one of the genders.

Cytological studies showed that the nuclear behaviour was consistent with the phenomena described above. Developing mycelia consist of uninucleate hyphae, but when fusion between them occurs, the nucleus from one hypha passes into the other and the two nuclei come to lie side by side in the fusion hypha, but have never at any stage been observed to unite. In some cases three or more hyphae have apparently fused, and in one instance of a triple fusion three nuclei were present in the fusion hypha. As the usually binucleate fusion hypha develops, the two nuclei divide and give rise to four; one nucleus of A gender passing to one end of the hypha, one of B gender to the other end, while one each of A and B genders remain at the centre. The mycelia which develop from the opposite ends of the fusion hypha are uninucleate and hyphal fusions occur when they come together (culture No. 5 was an exception, as in addition to uninucleate cells, others with two or more nuclei were present). Fusions were also observed when hyphae of the one species came into contact with hyphae of the other species.

DURIEZ (C.). **A propos des maladies de dégénérescence de la Pomme de terre.** [Note on the degeneration diseases of the Potato.]—*Rev. Hort.*, xcix, 14, pp. 367–368, 1927.

Attention is called in the present note to the continued spread in France of the various degeneration diseases of the potato (including frisolée, mosaic, blackleg, filosité, and dwarfing). The method proposed by Ducomet and Foëx [*R.A.M.*, iii, p. 98] for the selection of

resistant varieties by the roguing, year after year, of diseased plants in the field, has not proved entirely satisfactory in practice, since strains developed in this manner until they showed less than 5 per cent. diseased, occasionally reverted to an incidence of 20 per cent. and over, even when grown in soil not used for potatoes for periods of ten to fifteen years previously.

The interesting statement is made that degeneration diseases of the potato were known in France as early as in the middle of the last century, as shown by an article published in 1853 in the *Horticulteur Français* on a method suggested for the control of a disease which appears to have been filosité.

ATANASOFF (D.). **Net necrosis of the Potato.**—*Phytopath.*, xvi, 12, pp. 929–940, 5 figs., 1926.

After a brief review of previous work on net necrosis of the potato the author describes the disease in detail. The symptoms vary considerably according to the variety, but in most cases the leaves of infected plants show more or less rounded, bright yellow spots, which coalesce to form large irregular blotches—a condition described by Quanjer and others as aucuba mosaic [*R.A.M.*, v, p. 572]. On some varieties, however, such as Bravo no leaf symptoms have been observed. The tuber symptoms are most marked and develop most rapidly in the early varieties such as Midlothian Early and Ashleaf, in which they are apparent even at the time of lifting. When cut open the tubers show very pronounced rusty brown blotches, spots, or streaks in the parenchyma.

Experiments are described which indicate clearly that there is no connexion between leaf roll and net necrosis, but the relation of aucuba mosaic to net necrosis became apparent at a very early date, particularly in the case of the variety Ashleaf. The transmission of net necrosis was effected by grafting infected Roode Star tubers on Midlothian Early, and the resulting plants showed slight temporary symptoms of aucuba mosaic. Net necrosis tubers planted in the greenhouse produced plants which failed to show aucuba mosaic whilst similar material planted in the open developed the latter symptoms.

In order to see the effect of net necrosis on different varieties, disease-free tubers of Bravo, Midlothian Early, Eigenheimer, Immune Ashleaf, Bintje, May Queen, Industrie, and Success were grafted with Roode Star tubers affected with net necrosis. All these varieties developed symptoms of aucuba mosaic except Bravo, the symptoms varying somewhat on the different varieties.

Finally the author states that ten healthy Midlothian Early tubers grafted with May Queen tubers from aucuba mosaic infected plants obtained from Professor Quanjer, produced plants showing aucuba mosaic of the leaves and net necrosis of the tubers in each case.

SMITH (K. M.). **Observations on the insect carriers of mosaic disease of the Potato.**—*Ann. of Appl. Biol.*, xiv, 1, pp. 113–131, 3 pl., 1 fig., 1927.

This paper contains an account of experiments carried out to identify definitely which insects of those normally attacking the potato are disseminators of virus diseases. Preliminary experiments

extending over the years 1922–4 yielded negative results, but in 1925 work carried out on a wider scale with improved technique was more successful. The various types of insect-proof cages used in this work are described. Infected insects were placed both on the sprouts of tubers and on the haulms; the latter appeared to be the only satisfactory method for insects other than aphids. The results obtained in 1926 from the progeny of the plants inoculated under cages in 1925 showed that successful transmission of mosaic disease was obtained by means of the aphids *Myzus persicae* (12 infected progeny from 2 plants) and *Macrosiphum gei* (6 infected progeny from 2 plants) [*R.A.M.*, iii, p. 161], the controls remaining healthy. Some evidence of infection by means of the greenhouse white fly (*Asterochiton vaporariorum*) (2 infected progeny from 2 plants) and the leafhoppers *Zygina pallidifrons* (1 infected progeny from 1 plant); and *Eupteryx auratus* (1 infected progeny from 1 plant) was also obtained, but further work with these insects is required before definite conclusions can be drawn.

PARK (M.). **Notes on some physiological conditions affecting the parasitism of Rhizoctonia solani Kühn.**—*Year-Book Dept. of Agric., Ceylon, 1927*, pp. 47–48, 1927.

The experiments recorded in this paper were carried out to ascertain the effect of soil moisture and humidity of the air on the disease caused by *Rhizoctonia solani* [*Corticium solani*: *R.A.M.*, iv, p. 519; v, p. 19] which occurs on various plants in Ceylon.

Cotton seeds were germinated in soils of varying water content, infected with *R. solani*, and held in an atmosphere of 75 per cent. average humidity. The resulting seedlings showed 80 per cent. infection while the controls remained healthy. When the atmospheric humidity was 52·2 per cent. only seedlings in the wettest soil were diseased. Increasing the humidity of the air by covering the plants with beakers resulted in infection and death of the covered seedlings. In a further series of experiments it was found that in atmospheres of 100, 84·7, 54·6, 48·8, and 41·1 per cent. humidity, the percentages of affected plants were 100, 94·8, 84·4, 50, and 28·4, respectively. The extent of the attack on each seedling also showed a gradation through the series, until in the driest atmosphere only a small discoloured area at soil level was visible. All the controls remained healthy. These results are considered to indicate that the humidity of the air immediately above the soil plays an important part in governing the parasitism of *R. solani*.

Some recommendations for the control of this disease, based on the above experiments, are given. Nurseries should not be established in damp situations; shade in the nurseries should be reduced to a minimum; the soil drainage should be effective; and the spacing of plants should be wide. No such measures, however, can be successful in controlling the disease when the soil is infected.

BOYD (O. C.). **The relative efficiency of some copper dusts and sprays in the control of Potato diseases and insect pests.**—*Cornell Agric. Exper. Stat. Bull.* 451, 68 pp., 8 figs., 1926.

This is a detailed account of experimental work carried out

during 1921–3 in Suffolk County, Long Island, and in Washington County, to test the relative value of some copper dusts as compared with Bordeaux sprays in the control of potato diseases, and more particularly of *Phytophthora infestans*. The results showed that, under field conditions, sprayed potato foliage retained about 44 per cent. more copper for each unit applied per acre than dusted leaves; although the former lost more copper between the applications, the percentage loss was less than from the latter. In greenhouse experiments, the spray deposits proved more resistant to washing than copper-lime coverings. Under all conditions, only about half as much dust was retained by dry as by thoroughly moistened leaves, with consequently less effective control. The two proprietary Bordeaux dusts tested, namely, copper-carb and Sanders's green copper-arsenic dusts, were not as adhesive to the leaves as home-made copper-lime dust and adhesiveness was not improved by the addition of a casein spreader (kayso), though this substance increased to a marked extent the spreading qualities of the sprays. The amount of copper necessary to inhibit the germination of zoospores of *P. infestans* on glass slides was found to be about 0·311 mgm. per sq. m., while about twice this amount was required to prevent infection of plants in the greenhouse. In either case, the necessary amount of copper in the sprays was slightly less than that in the copper-lime dust, due no doubt to the greater covering power of the spray precipitate in mixtures of low concentrations.

When applied to damp foliage copper-lime dust appeared to be about equal in efficacy with Bordeaux sprays containing an equal amount of copper, for the control of early blight [*Alternaria solani*] and late blight (*P. infestans*). The results of three years' experiments showed that the sprayed plots produced an average gain in yield over the dusted plots of 7·2 bushels per acre. Freshly mixed copper-lime dust containing 10 per cent. of copper produced a very slight burning when applied to wet leaves; less than this caused no injury, but 20 per cent. resulted in severe burning. There were strong indications that heavy coatings of either dust or spray produced a dwarfing or stunting effect on the plants, entirely independent of copper injury to the leaves. Hydrogen-ion determinations made on samples of soils from plots that had received from eleven to fourteen applications of Bordeaux mixture or copper-lime dusts, showed no significant difference in reaction from that in the control plots.

The paper concludes by a comparison of the cost, under American conditions in 1922, of the various treatments. Using about 3 lb. of copper per acre, single applications of home-mixed copper-lime dust cost $2 per acre, commercial brands of dusts, $3·75 to $4, and Bordeaux mixtures, $1·50.

A bibliography of 72 titles is appended.

FOLSOM (D.) & BONDE (R.). **Potato spraying and dusting experiments 1921 to 1925.**—*Maine Agric. Exper. Stat. Bull.* 334, pp. 205–284, 8 pl., 2 graphs, 1926.

After a brief review of potato-spraying tests carried out at Maine from 1886 to 1921, a detailed report is given of spraying

and dusting experiments made during 1921–5 with Bordeaux mixture and copper-lime dust, respectively, particularly against early blight [*Alternaria solani*] and late blight (*Phytophthora infestans*) of potatoes, with the object of testing possible substitutes for standard methods. The varieties used were Irish Cobbler and Green Mountain.

The result of the four years' tests show that, with the same amount of metallic copper in each, dusting is almost as good as spraying for the control of late blight, but is markedly inferior in controlling early blight. Dusting also induces earlier maturing, but permits, nevertheless, about the same yield as spraying. The best time to apply the dust appeared to be soon after sunrise, as calm conditions could be expected most often at this period of the day, but in the region of the experiments suitable conditions were as difficult to find for dusting as for spraying. Dusting is also said to be disagreeable to some workers, as, apart from the danger of inhaling it, skin poisoning may result. Further, an analysis made in 1923 shows that the copper in Bordeaux mixture adheres better to the leaves than that contained in copper-lime dust.

The cost of dusting, based on these experiments, using dusts containing equivalent amounts of metallic copper with the sprays, is about half as great again as for spraying ($15·81 compared with $11·07 per acre for 6 applications).

From a consideration of the meteorological data and the incidence of the disease over a series of years, the authors conclude that at Orono, Maine, when the mean temperature for the month of July is below 67° F. and the rainfall over 3 inches, severe attacks of late blight usually result, and that without these conditions late blight is not likely to develop. Attention is called to the fact that July is the critical month in Maine, whilst in Vermont it is August, the explanation suggested being that in Maine the disease, if well started in July, can often maintain itself in August, in spite of a low average rainfall. Evidence is also presented indicating that a low temperature usually checks late blight in north-eastern Maine.

Although spraying in many regions has proved to be decidedly profitable, it is not always so. In Arostook County, Maine, during 1916–25 the average profits were very small, owing to various factors, including the checking of late blight by weather conditions and the curtailing of the growing season, usually prolonged as a result of copper stimulation, by early frosts. These facts are not considered sufficient justification for a reduction of spraying, but rather emphasize the need for more economical methods.

The effect of using a vine protector, which pushed the vines aside ahead of the wheels of the spraying machine, was not great enough to be significant under the conditions of the tests.

A bibliography of 99 titles is appended.

O'Brien (T. E. H.). **On the smoking of sheet Rubber in relation to mould prevention.**—*Rubber Res. Scheme (Ceylon) Bull.* 42, 36 pp., 1 pl., 1 diag., 1926.

In the present paper a description is given of tests carried out in

order to ascertain the extent to which the liability of sheet rubber to become mouldy can be influenced by alterations in the conditions of smoking. Rubber prepared in different ways was inoculated with a pure culture of *Oospora* sp., and incubated in a desiccator over a 7 per cent. solution of sodium chloride.

The figures demonstrate the superiority of uncombusted over combusted smoke in diminishing the liability of sheet rubber to mould, a result which is probably due to the fact that the amount of smoke absorbed by the rubber is greater in the former case than in the latter. Some disinfectant substance, probably of a volatile nature, is evidently contained in uncombusted smoke, but is absent or present to a lesser degree in combusted smoke. Sheet washed for two hours after rolling is less liable to mould than sheet washed for five minutes, and freshly smoked sheet is less liable to mould than sheet exposed to the air for eight days after smoking. The practice of hanging sheet to dry in the air after smoking is a frequent cause of mould, and is to be condemned. Thoroughly smoked sheet is shown to be much less liable to mould than lightly smoked sheet, and while colour is not necessarily a criterion of resistance to mould, it is recommended that estates should adopt the practice of smoking to a rich deep amber colour. Packing on the day of removal from the smoke house in order to avoid exposure to air is considered important, and care should be taken that the chests are thoroughly dried before being filled. In designing new smoke houses due consideration should be given to the provision of fires to give an adequate proportion of 'uncombusted' smoke. A detailed description of smoke chambers recently designed is appended.

With regard to the use of paranitrophenol [*R.A.M.*, v, p. 694], the author is of opinion that under ordinary conditions mould can be prevented by careful methods of manufacture, and considers that this substance should only be used in cases where these methods fail.

HINO (I.). **Studies on soil protozoa. III. Experimental studies in the abolishment of plant pathogens in soil and water.**— Pamphlet of the *Phytotechn. Inst., Miyazaki Coll. of Agric., Japan*, 13, 13 pp., 1 pl. [? 1926]. [Japanese, with English summary.]

In this paper the author gives an account of his investigations on the action of protozoa on plant pathogens in the soil, a subject which hitherto has not been studied, though protozoa are known to be capable of freeing water from the bacteria causing typhoid fever, cholera, and dysentery in man.

In experiments carried out with *Bacterium* [*Pseudomonas*] *citri*, *Bact.* [*Ps.*] *hyacinthi*, *Bacillus aroideae*, and a species of *Fusarium*, all these organisms were destroyed when protozoa were added to them in sufficient quantity.

As a result of his researches the author concludes that plant pathogens found in soil or water gradually diminish when protozoa are present, and that the protozoa commonly found in cysts on the surface of seeds and plants assist in protecting the plant from invasion by pathogens in the presence of sufficient moisture.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1926.**—*Journ. Min. Agric.*, xxxiii, 12, pp. 1108–1121, 4 pl., 1926.

After reviewing in some detail the spread of the downy mildew of the hop (*Pseudoperonospora humuli*) on the Continent (in the course of which it is stated the disease occurred in Jugo-Slavia in 1924–6), the authors give an account of the known outbreaks during 1926 in the southern hop growing counties of England. The first sign of 'spike'-like shoots was noticed on 26th March, while the majority of cases of 'spiked' blue tips and laterals with their characteristically attacked leaves [*R.A.M.*, v, p. 638] were seen during May, June, and July. The varieties showing bine infection were Bramling, Cobbs, Tutsham, Eastwell Golding, Rodmasham Golding, and Amos' Early Bird.

In 1926 the disease was also reported on the hop cones in a number of gardens in Kent and the adjacent counties, and frequently the attack was remarkable for its very sudden appearance. In several cases the disease was so bad that the hops were left unpicked, but reports were received regarding discoloured hops which, on being dried, showed a much better colour than was anticipated. The downy mildew was usually accompanied by red mould (*Sphaerotheca humuli*). The varieties showing cone attack included all those mentioned above as well as two or three others. It was noted that Tolhurst was decidedly susceptible, while Fuggles was to some extent resistant.

During 1926 it was found that male hop flowers at Wye were severely attacked by downy mildew on the perianth lobes, causing, however, no great discoloration. Oospores were found in the perianth tissues.

Very encouraging results are reported from the control measures previously recommended [loc. cit.].

SALMON (E. S.). **Notes on three new varieties of Hops.**—*Journ. Inst. of Brewing*, N.S., xxxiii, 1, pp. 12–14, 1927.

The writer discusses the liability to disease of three promising new varieties of hops.

OF 27, a hybrid between the German variety cultivated at Hersbruck and an English male hop, did not show either at Wye or at the Research Station at East Malling, Kent, any signs of mould [*Sphaerotheca humuli*], but at both places it proved decidedly susceptible to mosaic disease, though not more so than some of the commercial varieties largely grown at the present time. The writer points out that the figures respecting mortality from this disease, obtained in trials at East Malling, should not be taken as necessarily holding good for other localities, since, for some reason at present unknown, varieties of hops susceptible to the mosaic disease become virulently attacked when planted at East Malling.

M 45, raised from the American variety Oregon Cluster and an English male hop, proved no more susceptible to mould than varieties commonly cultivated, but showed a greater liability to be attacked by blight (*Aphis*). Although immune from mosaic disease itself, M 45 was found to be a carrier of this disease to other susceptible varieties.

OP 21, the result of a cross between the English male hop and the seedling K 52, itself a hybrid of Oregon Cluster and the English male hop, has not become attacked either at Wye or East Malling by mould or mosaic disease.

KORFF. **Massnahmen zur Förderung der Bekämpfung der Hopfenkrankheiten in Bayern.** [Measures for promoting the control of Hop diseases in Bavaria.]—*Prakt. Blätter Pflanzenbau und Pflanzenschutz*, iv, 11, pp. 247-248, 1927.

In response to public demand following the 1926 epidemic of downy mildew of the hop [*Pseudoperonospora humuli*: see below] in Bavaria, the Bavarian Ministry of Agriculture, in January, 1927, appointed an inspector with headquarters at Weihenstephan, and established a research and advisory bureau at the Landesanstalt für Pflanzenbau und Pflanzenschutz in Munich, to investigate the various diseases and pests that threaten the crop in that country, and to give the necessary advice and help to the growers. A limited State grant of funds has also been made to facilitate the acquisition by the more necessitous growers of spraying apparatus.

KORFF. **Die Bekämpfung der Peronosporakrankheit des Hopfens.** [Control of the downy mildew of the Hop.]—*Prakt. Blätter Pflanenzenbau und Pflanzenschutz*, iv, 11, pp. 250–254, 1927.

The measures recommended in the present paper for the control of downy mildew of the hop (*Pseudoperonospora humuli*) [see preceding abstract] consist in immediately removing and burning all the affected parts of the plants, and spraying with Bordeaux mixture, the date of the first application and the number of treatments depending on the local weather conditions. It is, however, advisable to spray the hop plants for the first time as soon as the leaves unfold, with a 0·5 per cent. Bordeaux mixture. Later 1 per cent. Bordeaux may be applied, returning to the 0·5 per cent. concentration during the flowering period. As indirect control measures, the necessity of thorough tillage, weeding, and well balanced fertilization of the hop gardens is strongly emphasized, and also avoiding low-lying and damp places for the establishment of hop gardens. The practice of inter-cropping in hop gardens is to be discouraged.

FLACHS. **Bestehen Zusammenhänge zwischen dem falschen Meltau und der Doldenbräune des Hopfens?** [Is there any connexion between downy mildew and the browning of the Hop cones?]—*Prakt. Blätter Pflanzenbau und Pflanzenschutz*, iv, 11, pp. 255–258, 1927.

In 1924, when downy mildew of the hop (*Pseudoperonospora humuli*) was first recorded in Württemberg, a strong outbreak occurred in the Hallertau hop growing region of Bavaria of a browning of the hop cones [*R.A.M.*, iv, p. 241], which was then attributed mainly to the cold and damp weather conditions prevailing in that year, although occasionally a species of *Fusarium* and a species related to the vine mildew fungus [*Plasmopara viticola*] were isolated from the discoloured cone sepals. The following year was marked by the appearance of the downy mildew in Bavaria, apparently starting in those gardens where the cone

browning was most prevalent, and since then the disease has spread to a threatening degree in the country [see preceding abstracts]. A new examination, made in 1926, of material from 1924, confirmed the presence on the discoloured cones of fructifications typical of *P. humuli*, and the author concludes that the 1924 diseased condition of the cones was partly due to attacks of this fungus.

WALKER (M. N.) & STAHL (C. F.). **Certain Grass hosts of the Sugar-cane mosaic disease and of the Corn aphid considered in relation to their occurrence in Cuba.**—*Trop. Plant Res. Foundation Bull.* 5, 14 pp., 1926.

The observations of other investigators on the grasses which serve as hosts of the maize aphis (*Aphis maidis*) and those which are susceptible to sugar-cane mosaic, are discussed in relation to the spread of the disease in sugar-cane cultivations. All the cultivated and wild grasses recorded hitherto as hosts of the maize aphis and those susceptible to mosaic are listed with notes on their occurrence in Cuba. It is believed that those present in that island are far more important as host plants of the aphis, the only known vector of mosaic in sugar-cane, than as sources of the virus.

Among cultivated grasses sorghum is considered to be the greatest menace to sugar-cane in Cuba, as it is a preferred host of the aphis and very susceptible to infection by the disease; it should not be planted in the neighbourhood of sugar-cane fields. Although mature maize plants are frequently heavily infested by the maize aphis, the authors have found it difficult to keep that insect alive on young plants for more than a few days. The ornamental eulalia (*Miscanthus sinensis*) and Guatemala grass (*Tripsacum laxum*) are the only perennial species (apart from sugar-cane) which have been reported as susceptible to mosaic; the latter is grown for forage in Cuba, but the authors have not found it to be a favoured host of the maize aphis, and attempts to infect it with the disease have failed. Elephant grass (*Pennisetum purpureum*), a perennial species which is now being widely planted in Cuba, exhibits a mottling of the young unfolding leaves very similar to mosaic; this mottling, unlike mosaic, has been observed in Porto Rico to be transmitted by the true seed, and is regarded as a peculiarity of the plant, as attempts to infect elephant grass with mosaic have given negative results.

The two common annual weed grasses 'grama pintada' (*Echinochloa colonum*) and 'pata de gallina' (*Syntherisma sanguinalis*), which are preferred hosts of the aphis and susceptible to mosaic, are regarded as the most important wild species in Cuba promoting the transmission of the disease in sugar-cane.

COOK (M. T.). **El mosaico de la Caña de Azúcar en Puerto Rico.** [Sugar-cane mosaic in Porto Rico.]—*Rev. Agric. Puerto Rico*, xvii, 5, pp. 6, 13, 2 figs., 1926.

In this paper the author calls attention to the principal causes responsible for the persistent prevalence of mosaic of sugar-cane in Porto Rico. In addition to an evident laxity in regard to diseased plantations, insufficient consideration is given to the selection of setts, and there is a tendency to propagate good yielding varieties

regardless of their susceptibility to disease. Control measures are sometimes carried to extremes for a brief period, but after the disease shows signs of reduction neglect follows and mosaic reappears with renewed activity. Whenever there is 2 per cent. or more of mosaic in a plantation it is recommended to establish a nursery reserved for cane used for propagation purposes, and the importance of keeping plantations free from weeds likely to harbour transmitting agents such as the maize aphid [*Aphis maidis*] is emphasized.

BREMER (G.). **De Bladscheedeschimmel Nigrospora panici Zimmermann, een vorm van Melanconium sacchari.** [The leaf sheath fungus *Nigrospora panici* Zimmermann, a form of *Melanconium sacchari*.]—*Meded. Proefstat. Java Suikerind.* 22, pp. 885–896, 2 pl., 5 figs., 1926.

A detailed description is given of a spotting on the leaf sheaths of the sugar-cane varieties, EK 28, EK madoe, and 2753 POJ, observed in 1925 in two localities of Java. The spotting, which apparently caused no serious injury to the canes, was also occasionally found on the stems of the first-named variety under the spots on the leaf sheaths. Isolations from the diseased tissues yielded a species of *Cladosporium*, considered to be secondary and purely saprophytic, and a fungus which was identified as *Nigrospora panici* [*R.A.M.*, iii, p. 469]; the latter was shown to be pathogenic to sugar-cane leaf sheath tissues scorched with a red-hot glass rod. Pure cultures from the large, black spores, 14 to 18 by 11 to 16 μ in diameter, grown on sugar-cane juice agar, oats-malt agar, or potato-glucose agar, gave rise to a growth strongly suggestive of that described by Went (*Ann. of Bot.*, x, p. 583, 1896) as obtained by him by germinating a single spore of *Melanconium sacchari*. Went further claimed to have obtained, on surface-sterilized sugar-canes inoculated with the large, black spores, 14·5 to 16 by 12 to 13 μ, produced by his cultures, a mycelium that bore the small and elongated spores typical of *M. sacchari*; he therefore considered the former as a fruiting form of the latter. The present author furnishes the following evidence corroborating Went's view; in one out of ten attempts, he obtained *M. sacchari* from surface-sterilized canes inoculated with *N. panici*, and, conversely, in one out of three inoculations, *N. panici* from surface-sterilized canes inoculated with *M. sacchari*. Similar results are stated to have been obtained by Miss Schwartz, of the Instituut voor Plantenziekten, to whom a specimen of *N. panici* was sent.

JACKSON (H. S.). **The rusts of South America based on the Holway collections. II.**—*Mycologia*, xix, 2, pp. 51–65, 1927.

In this paper, which continues the series commenced in 1926 [*R.A.M.*, v, p. 766], the author describes 33 rusts, including ten new species, occurring on members of the families Salicaceae to Berberidaceae.

Dänemark: Pflanzeneinfuhr. [Denmark: importation of plants.] —*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 1, pp. 11–12, 1927.

This is a brief notification of new Danish regulations introduced

by Order dated 10th December, 1926, governing the importation of plants and parts of plants into Denmark, under which only such parcels are admissible as are forwarded direct from the producer to the Danish buyer. In regard to potatoes, the zone of freedom from wart disease [*Synchytrium endobioticum*] beyond which potatoes are allowed to be imported, is reduced from 10 to 5 km. Henceforth the certificates accompanying consignments must be signed personally by the grower, with the indication of the locality where the produce was grown.

BAUNACKE & TEMPEL. **Was ist bei der Aus- und Einfuhr von Kartoffeln von und nach Deutschland zu beachten?** [What must be taken into consideration in regard to the export from, and import of Potatoes into Germany?]—*Merkbl. Sächs. Pflanzenschutzgesellsch. zu Dresden*, 1, pp. 1-8, 1927.

This is a summary, in tabular form, of the regulations governing the importation of potatoes in various countries in the world, with special reference to wart disease [*Synchytrium endobioticum*].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Deutsch. Pflanzenschutzdienst*, 9, 1927.

MAGDEBURG DISTRICT. Police regulation of 13th March, 1926, provides for the compulsory destruction of all barberry bushes at a distance of less than 200 m. from fields sown to cereals, as a measure directed towards the control of rust [*Puccinia graminis*].

BREMEN. By Decree of 21st November, 1926, it is enacted that any firm desiring to sell potato varieties immune from wart disease (*Synchytrium endobioticum*) must make a declaration to that effect to the Medical Board.

WÜRTTEMBERG. By a decree of 23rd July, 1926, regulations are promulgated for the wholesale and retail trade in poisonous insecticides and fungicides.

Protection des plantations de Bananiers aux colonies, contre la 'maladie de Panama'. [Protection of Banana plantations in the colonies against Panama disease.]—*Agron. Colon.*, xvi, 109, pp. 27-28, 1927.

Regulations under the Plant Diseases Law in France have recently been issued prohibiting the importation into the French colonies of banana plants coming from countries declared to be infected with Panama disease (*Fusarium cubense*) or from countries where there are no restrictions or inspection service. Consignments will only be allowed to enter when accompanied by a certificate from an accredited official of the country of origin stating that the locality where the plants were grown is free from disease. Provisions are made, however, for the introduction of any plants which may be considered desirable for reasons of technical or economic interest. All introductions will be subject to quarantine for a certain time, after which healthy plants will be conveyed to their destination, but any plants showing symptoms of disease will be burnt without incurring any liability for indemnity on the part of the importer.

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CUNNINGHAM (G. H.). **Fourth supplement to the Uredinales and Ustilaginales of New Zealand.**—*Trans. New Zealand Inst.*, lvii, p. 186, 1926.

In this supplement [*R.A.M.*, v, p. 521] the author records *Ustilago hypodytes*, on *Agropyron repens*, as new for New Zealand. Two new hosts of New Zealand rusts are also recorded, *Scirpus sulcatus* for *Uredo scirpi-nodosi* McAlp., and *Clematis foetida* for *Aecidium otagense*.

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Hongos parásitos y saprofitos de la República Dominicana (8ª serie).** [Parasitic and saprophytic fungi of the Dominican Republic (8th series).]—*Bol. R. Soc. Española Hist. Nat.*, xxvi, 10, pp. 491–499, 9 figs., 1926.

In continuation of the series of papers on Dominican fungi [*R.A.M.*, vi, p. 259] the authors record on the glumes and peduncles of Sudan grass (*Andropogon sorghum* var. *sudanensis*) the occurrence of a new species of *Helminthosporium*, which is named *H. sudanensis* sp. nov. ad interim. The spores are 4-septate, the end cells often hyaline, the spore sometimes strongly curved, measuring 30 to 50 by 12 to 14 μ. With it were associated *Cladosporium gramineum* and *Fusarium subulatum* Appel & Wollenw. Leaves of *Hibiscus brasiliensis* were found attacked by *Oidium abelmoschii* Thüm. and later by *Fusoma hibisci* sp. nov. The macrospores of the latter are typically fusoid, sometimes curved, 1- to 5-septate, and 20 to 50 by 3·5 to 4 μ. *Guignardia heveae* sp. nov. ad interim is described on living leaves of *Hevea brasiliensis*, and *Phyllosticta theobromae* D. Alm. & S. da Cam. f. *dominicana* forma nova, on leaves of *Theobroma cacao*.

Toro (R. A.). **Fungi of Santo Domingo. I.**—*Mycologia*, xix, 2, pp. 66–85, 1 pl., 1927,

This paper is the first part of a systematic list of fungi collected in the Dominican Republic in March, 1926. Of the whole collection, which consists of over 400 specimens, 97 species are enumerated in the present paper. The host plants are recorded in nearly all cases; full citations are given, and, in some cases, critical notes. Three new species of Perisporiales are published with English diagnoses and *Myriangiella arcuata* in the Hemisphaeriaceae.

Sydow (H.). **Fungi in itinere costaricensi collecti. Pars tertia.** [Fungi collected on a journey in Costa Rica. Third part.]—*Ann. Mycol.*, xxv, 1–2, pp. 1–160, 8 figs., 1927.

This continues the author's account of the fungi which he collected in Costa Rica in 1924–5 [*R.A.M.*, vi, p. 189]. Although this paper deals largely with leaf parasites, and their hyper-parasites on the leaves of tropical trees, most groups of fungi are represented. Very full descriptions are given of the species, and 29 new genera are proposed.

Muller (H. R. A.). **Onderzoekingen over Colletotrichum lindemuthianum (Sacc. et Magn.) Bri. et Cav. en Gloeosporium fructigenum Berk. forma hollandica nova forma.** [Investigations on *Colletotrichum lindemuthianum* (Sacc. et Magn.) Bri. et Cav. and on *Gloeosporium fructigenum* Berk. forma *hollandica* nov. forma.]—*Meded. Landbouwhoogeschool, Wageningen*, xxx, 1, 93 pp. 16 pl., 1926. [English summary on pp. 73–89.]

In this paper the author gives in greater detail an account of his investigations on the biologic races of *Colletotrichum lindemuthianum* occurring in Holland (a preliminary account of which had already been noticed) [*R.A.M.*, v, p. 645]. Four isolations of the fungus were made from diseased pods of *Phaseolus vulgaris* from different parts of Holland, namely, strains Z I and Z II from Zeeland, strain E from Enkhuizen, and strain W from Westland.

Inoculations upon young bean plants of a number of American varieties showed that the Dutch strains are different from the American strains α, β, and γ [*R.A.M.*, iii, p. 110] and from each other. Further tests on the varieties used by Leach [*R.A.M.*, iii, p. 109] indicated that the strains Z I and Z II may both be classed with form VIII of Leach, while strains E and W appear to be identical with forms IV and V, respectively, of the same author.

Besides differences in the degree of infection of the varieties, differences in the mode of infection were also observed, e. g. Z II attacked the whole stalk of the Yellow Eye variety, whilst Z I only attacked the base. Certain cultural distinctions were also found between the strains; the lethal temperature for Z I is between 28° and 30° C. and for the other strains between 30° and 35°. Below 20°, E and W grow more slowly than Z I and Z II, the optimum for the former being about 25° and for the latter about 20°.

The overwintering of the fungus in the soil in Holland was proved by exposing cultures of the fungus in soil in tubes to various low temperatures, one set of cultures being left outside in

a shelter during the winter. The fungus was also found able to resist a temperature of −15° to −20° for a period of ten days.

Immature perithecium-like bodies, containing structures resembling asci, with 2 to 8 nuclei, were observed in cultures, at least 2½ months old, of each of the strains isolated, especially on cultures kept in the light.

From diseased pods of *P. multiflorus* growing under apple trees, a strain (K) of a species of *Gloeosporium* was obtained and tested upon seedlings of *P. vulgaris*. Only a trace of infection was found on most varieties, and the rest showed numerous small brown spots. From one, more heavily infected, plant two forms of the fungus were isolated, one of which exhibited sectoring in a number of cultures. Inoculations of strain K on apple fruits were successful and the fungus was therefore identified as *G. fructigenum*. Comparative inoculations with *G. fructigenum* f. *germanica* and *G. fructigenum* f. *americana* showed that strain K is distinct from either of these forms. It is accordingly named *G. fructigenum* f. *hollandica*.

Further experiments showed that the passage of this strain through apples and tomatoes increased the virulence of the fungus for these hosts, whilst passing it through *Phaseolus vulgaris* decreased its pathogenicity to apples and increased its virulence towards beans. Strain K as isolated was only a wound parasite for tomatoes, but after passage through apples it could then infect the unwounded fruit. From *G. fructigenum*, therefore, a new form may arise scarcely distinguishable from a form of *C. lindemuthianum*, and it is not impossible that the so-called biologic forms of the latter may be forms of *G. fructigenum*.

A bibliography of 49 titles is appended.

BUNKER (F. H.). **El cultivo de Tabaco en Puerto Rico. Operaciones en el campo.** [Tobacco cultivation in Porto Rico. Field operations.]—*Rev. Agric. Puerto Rico*, xvii, 5, pp. 32–39, 5 figs., 1926.

In the section dealing with the tobacco diseases prevalent in Porto Rico (pp. 37–38), a popular account is given of the mosaic disease. The eradication and destruction of plants showing the first sign of disease is considered essential, and attention is drawn to the danger of transmission by insect carriers, by footwear, and by the use of tobacco refuse as manure or tobacco dust as insecticide. The disease known as black shank [? *Phytophthora nicotianae*] is also said to be common in seed-beds.

Root rot (*Thielavia basicola*) is not infrequent in Porto Rico, especially on land used for tobacco for several years in succession. Disinfection of the seed before sowing is recommended, but to allow land showing signs of disease to remain fallow for some years is probably still more effective. The variety Connecticut Round Tip ('Borinquen') is stated to have proved completely resistant to the disease.

Rust spots, most frequent in periods of heavy rainfall, are not necessarily due to a fungus, but more probably to cultural conditions.

HOPKINS (J. C. F.). **On the nature of bacterial diseases of Tobacco.**—*Rhodesian Agric. Journ.*, xxiv, 2, pp. 129–134, 4 pl., 1927.

In this paper, which was written with the object of encouraging growers in Rhodesia to establish an organized system of disease prevention, a popular account is given of the nature of bacterial diseases of tobacco, referring particularly to wildfire [*Bacterium tabacum*], angular leaf spot [*Bact. angulatum*], and wilt (*Bact. solanacearum*).

The necessity is urged of eliminating these organisms as far as possible from the seed-bed by burning or steam sterilization of the soil, by disinfecting all seed with corrosive sublimate, and by spraying the young plants with Bordeaux mixture, while in the field careful watching for the first symptoms of disease and the immediate removal and destruction of infected leaves are recommended.

LINK (G. K. K.), JONES (P. M.), & TALIAFERRO (W. H.). **Possible etiological rôle of Plasmodiophora tabaci in Tobacco mosaic.** —*Bot. Gaz.*, lxxxii, 4, pp. 403–414, 1926.

Recent work has focused attention on the possible association of protozoa with mosaic disease of tobacco and other plants [*R.A.M.*, v, pp. 523, 686], and the writers undertook the following investigation in order to determine whether there is a constant association of *Plasmodiophora tabaci* with tobacco mosaic, and whether it plays any part in the etiology of the disease.

By means of tissue cultures made in flasks containing Knop's solution, incubated at 15°–25° C., it was found that *P. tabaci* can be cultured from both healthy and diseased plant tissues, provided that these are not washed in an antiseptic solution. If the tissues are sterilized with mercuric chloride, 1 : 1,000, *P. tabaci* can be obtained from diseased plants, but only rarely from healthy plants.

Inoculations carried out with cultures containing various stages of the organism, from diseased and healthy tissues, and cultures from diseased parts not containing the organism, showed that mosaic only resulted from cultures derived from diseased plants, irrespective of the presence or absence of the organism in the inoculum. The presence of *P. tabaci*, therefore, is not essential to the development of mosaic.

Tobacco juice from diseased plants and cultures of *P. tabaci* were filtered through diatomaceous and porcelain filters. Part of the filtrates was inoculated into healthy tobacco plants, and part incubated for several weeks to see if *P. tabaci* would develop. It was shown that such filtrates can produce mosaic, but in no case did the organism develop in the filtrates, though the suitability of such a medium was demonstrated at the end of the experiment by successful inoculation with *P. tabaci*. It was further demonstrated that the plasmodial stage of the organism was not filterable.

In discussing the results obtained the authors point out that the isolation experiments indicate that the organism exists in some form, probably as cysts, on the surface of many healthy and diseased plants, and they favour the view that diseased plants possibly possess more breaks in the epidermis through which *P.*

tabaci can obtain entrance into the leaf parenchyma and live there as a secondary invader. Both the inoculation and filtration experiments confirm the non-pathogenic character of the organism and the authors conclude that tobacco mosaic is still to be regarded as the result of infection by an ultramicroscopic virus.

BERKELEY (G. H.). **Studies in Tomato streak.**—*Scient. Agric.*, vii, 6, pp. 210–223, 2 pl., 1927.

Several severe outbreaks of tomato streak in the spring of 1925 and previous autumn in greenhouses at Vineland, Ontario, led to a series of investigations being instituted by the Dominion Laboratory of Plant Pathology, St. Catharine's, Ontario.

After describing the well-known symptoms of the disease and its variations [*R.A.M.*, v, p. 195], the author records an experiment carried out in commercial greenhouses with the object of controlling the disease. Every care was taken to produce as steady growth of the tomato plants as possible by proper ventilation, even temperature, and avoidance of nitrate dressings, with the result that a crop was obtained completely free from streak. Moreover these plants remained healthy even when inoculated with streak disease, though under other conditions the same inoculum gave 100 per cent. infection.

In order to elucidate the factors responsible for this result, further experiments were made. In the first of these, twenty-four plants were inoculated with streak, and then six of them heavily treated with nitrogenous manures, six left as controls, and twelve scattered throughout the greenhouse. The six heavily manured plants became rapidly and severely infected, the control plants developed streak symptoms, but not till several days later and to a less extent; the remaining twelve developed streak, but by careful handling only transmitted the disease to surrounding plants in three cases. In a further experiment it was found that the disease was not transmitted by the 'pinching off' method of pruning in a single case. Control measures based on the results of these experiments are given.

In the second part of the paper experiments are recorded dealing with the etiology of the disease. The results of inoculations with material from streak plants gave very variable results; in one set no infection was obtained from 55 inoculations, while in four other sets 100 per cent. infection was secured. The author considers, however, that his experiments have clearly demonstrated that the disease is of the filterable virus type.

A large number of other inoculation experiments are described and tabulated, from the results of which the author draws the following conclusions. Juice from healthy potato plants can produce definite streak in tomatoes, as can also potato mosaic and potato streak juices. The combination of tomato and potato mosaic viruses is not necessary for the production of the tomato streak disease [*R.A.M.*, v, p. 636]. Potato streak is transferable to tomatoes (100 per cent. infection was obtained in plants in the open). Tomato streak is transferable to healthy tobacco, producing mosaic symptoms with necrosis, and such tobacco 'streak' is in turn transmissible to tomato and back

to tobacco. Mosaic potato produces streak in tobacco as well as in tomato.

JOESSEL (P. H.). **Sur l'abondance des périthèces de Microsphaera quercina (Schw.) Burr. dans la basse vallée du Rhône au cours de l'automne 1926.** [On the abundance of perithecia of *Microsphaera quercina* (Schw.) Burr. in the Lower Rhone valley during the autumn of 1926.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 314–318, 1 fig., 1926.

Since the first discovery of the perithecia of the oak mildew (*Microsphaera quercina*) in France by Arnaud in 1911, they have been recorded in the Rhone basin and in Provence on several different occasions [*R.A.M.*, iv, p. 452]. In 1925 and 1926 the author found perithecia in abundance, chiefly on the youngest leaves, in certain localities of this region, but only on *Quercus pubescens*. The author considers that the frequent production of perithecia by this fungus in recent years is due to the gradual adaptation of this American species to its European host plant.

GARD (M.). **Sur la chlorose du Noyer cultivé (Juglans regia L.).** [On chlorosis of the cultivated Walnut (*Juglans regia* L.).]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 265–266, 1926.

Chlorosis of the walnut was exceptionally prevalent in France during 1926 as a result of the heavy rains followed by prolonged drought. The severity of attack was especially noticeable on the calcareous soil of Charente, but also occurred in Dordogne, Corrèze, and Lot. Sometimes only part of the walnut tree was attacked and the remainder retained the green colour of the leaves; diseased leaves became distinctly yellow, but showed no alteration in size or reduction in numbers.

The application of iron sulphate to the trees during the spring is recommended for the control of the disease, together with treatment of the wounds after pruning with iron sulphate either in a 25 or 30 per cent. solution or in dust form.

MANSHARD (E.). **Der Buchenkeimlingspilz Phytophthora omnivora de Bary und seine Bekämpfung.** [The Beech seedling fungus *Phytophthora omnivora* de Bary and its control.]—*Forstarch.*, iii, 6, pp. 84–86, 2 figs., 1927.

Beech nurseries in Germany are stated to have sustained heavy losses in 1926 owing to severe outbreaks of seedling blight caused by *Phytophthora omnivora*, which in some cases wiped out entire fields of seedlings. This epidemic is chiefly ascribed to the cold and wet weather which prevailed throughout the spring of that year. Experiments conducted by the author at the Forestry Experimental Station of Halstenbek-Holstein showed that the disease may be controlled commercially by spraying the seedlings with 1·5 per cent. Bordeaux mixture. The effect of the treatment was well demonstrated in a field where an unsprayed plot was almost totally destroyed, while in the treated plots on either side diseased seedlings were hardly to be found. There was also evidence that the fungus may be seed-borne, and further experiments are contemplated to establish the effect of seed treatment before sowing.

Een ziekte in de Iepenboomen. [A disease of Elm trees.]—*Floralia*, xlvii, 47, pp. 761–762, 1 fig., 1926.

Ornamental elms in Holland are stated to have suffered in recent years from a pathological condition expressed by the arrested growth of the young shoots and the incomplete development of the leaves. In some cases these symptoms were only temporary, normal growth being resumed after a few weeks. No insect or fungus parasite has hitherto been found associated with this phenomenon.

WAGNER (K.). **Erkrankungen unserer Gehölze. Rhytisma acerinum (Runzelschorf).** [Diseases of our trees. *Rhytisma acerinum* (black spot).]—*Gartenflora*, lxxvi, 2, pp. 81–82, 1927.

The black spot disease (*Rhytisma acerinum*) is stated to be very common in Germany on the sycamore [*Acer pseudoplatanus*] and the plane [*A. platanoides*]. No serious injury is caused to adult trees, but seedlings and young trees are adversely affected by the disease, and should be sprayed with Burgundy mixture. To prevent the spread of the fungus, all the fallen leaves should be collected in the autumn and winter and burnt, or mixed with lime to kill the spores and then buried.

BOYCE (J. S.). **Observations on White Pine blister rust in Great Britain and Denmark.**—*Journ. of Forestry*, xxiv, 8, pp. 893–896, 1926.

The author records in this paper the occurrence of white pine blister rust (*Cronartium ribicola*) on eastern white pine (*Pinus strobus*) at Bagley Wood, near Oxford, and at Westwick, near Norwich [*R.A.M.*, iv, p. 615]. Himalayan pines (*P. excelsa*) were observed growing in proximity to infected trees yet remaining quite free from the disease.

In Denmark, which was visited in September, 1925, the author states that in the State forest of Almindingen on the Island of Bornholm, the eastern white pine has been practically ruined by blister rust. Trees of all sizes were either killed or slowly dying, though occasional individuals had apparently escaped completely. The humidity and rainfall are stated to be high throughout the year, but heavy infection apparently occurs periodically, not yearly. No wild currants or gooseberries were found in the neighbourhood, but black currants in forest gardens were heavily infected, while red currants and cultivated gooseberries appeared to be quite free from attack.

HAHN (G. G.). **Phomopsis juniperovora and closely related strains on Conifers.**—*Phytopath.*, xvi, 12, pp. 899–914, 3 pl., 1 fig., 1926.

In this paper the author reports further progress in his study of the cedar blight disease and its causal organism *Phomopsis juniperovora* [*R.A.M.*, vi, p. 214]. This disease (which it is suggested might be better termed a disease of conifers) is now known to be causing serious and widespread damage to coniferous nursery stock and ornamental plantings in the United States. Closely

related *Phomopsis* strains, which have also been found causing similar symptoms, are probably only forms of *P. juniperovora*, and are placed tentatively in a B group to distinguish them from the typical or A group. The latter have been isolated from species [which are listed] of *Juniperus*, *Cupressus*, *Thuja*, and *Chamaecyparis*; the B group, from *Juniperus*, *Thujopsis*, *Cephalotaxus*, *Taxus*, *Taxodium*, *Sequoia*, *Pseudotsuga*, and *Larix*; the fungus was also found on species of *Abies*, *Cryptomeria*, and *Tsuga*, but has not been studied in culture. Twelve new hosts are reported for the A group, and thirteen for the B group. Preliminary spore measurements of the A and B strains show slight differences in shape and size of α and β spores.

Host relationships of *P. juniperovora* have been established by preliminary artificial inoculation. Both A and B groups are parasitic on eight-year-old trees of *Pseudotsuga taxifolia*, Pacific coast form, though the A strains appear to be more virulent. The A forms from *Juniperus*, *Cupressus*, and *Chamaecyparis* readily attacked two-year-old stock of *Cupressus arizonica* and *Thuja orientalis*; whilst inoculations on the two latter hosts with strains of the B group from *Taxus* and *Pseudotsuga* were unsuccessful. Positive results were obtained on *Larix europaea* with the A group from *Juniperus*, but no infection resulted on *Pinus* spp. and *Picea excelsa* with strains from either group.

In excessively wet seasons the organism becomes particularly aggressive, and whole beds of seedlings may be attacked in a very short time. One instance is cited when the discontinuance of overhead watering greatly aided the control of the disease. Crowding and heavy shading of seedlings and weakening of older trees by unfavourable growth conditions also predispose to infection, whilst wounding should be carefully avoided as the fungus is said to be a wound parasite.

Jaczewski (A. A.). О редком ржавчинном грибке **Chrysomyxa (Barclayella) deformans Jacz.** [A rare rust fungus *Chrysomyxa (Barclayella) deformans* Jacz.]—*Изв. Ленинградского Лесного Инст.* [*Bull. Leningrad Forestry Inst.*], cxxxiii, 1, pp. 131–149, 5 figs., 1926. [French summary.]

The fungus described in detail in the present paper was received in 1925 by the author for identification from the Verny Plant Protection Station, Western Siberia, and was borne on a branch of *Picea schrenkiana*. It is stated to occur fairly commonly on this host in the Przewalsk and surrounding districts. The fungus only attacks the young shoots, which become considerably stunted. The needles on such shoots are characteristically thickened, of a fleshy consistency, retroflexed in a semicircle, and assume a bright orange colour; on their upper surface are borne two elongated, waxy sori extending along their whole length and separated from each other by a narrow furrow running along the midrib. Small and isolated sori may also occur occasionally on the under side of the needles. Externally the symptoms are very similar to those caused by *Chrysomyxa woronini* Tranzsch. on *P. excelsa*, but the fungus on *P. schrenkiana* differs morphologically by the total absence of a peridium and by the fact that the sori do not become powdery

but always remain of waxy consistency. In cross sections the sori are seen to consist of strongly adpressed teleutospores in chains of 3 to 7 each. The teleutospores are unicellular, elongated, ellipsoidal, smooth, with a thin, hyaline wall, with orange-coloured contents, and 12 to 18 by 10 to 15 μ in diameter. The spores germinate *in situ* immediately on maturing by a cylindrical basidium, the length of which depends on whether it originates from the apical or lower spores in the chain. Soon after formation the basidium is divided by transverse septa into four cells, which rapidly round up and separate into four spherical spores, 7 to 9·5 μ in diameter, which are also capable of germinating *in situ*. In rare cases, probably depending on the atmospheric moisture conditions, the basidia do not divide into spores, as described above, but form normal basidiospores on sterigmata.

Although no pycnidia were found in the specimen examined, the author believes that this fungus is an autogenous form of the Lepto-uredineae type. Morphologically it is indistinguishable from *Barclayella deformans* described by Dietel on *P. morinda* in the Himalaya. The author considers, however, that there are not sufficient grounds for separating *Barclayella* from *Chrysomyxa*, and therefore renames the fungus *Chrysomyxa deformans* Jacz.

It is stated that in 1925 *C. woronini* was found on *Picea obovata* in the Yakoutsk region [Siberia].

LEINES (W.). **Ein Versuch zur Kohlhernie-Bekämpfung.** [An experiment in the control of club-root of Cabbage.]—*Nachricht. über Schädlingsbekämpf.*, i, 4, pp. 179–181, 1 fig., 1926.

The results of the experiment briefly described in the present paper showed that steeping cabbage seed for one hour in 0·25 per cent. uspulun somewhat reduced the incidence of club-root [*Plasmodiophora brassicae*] on heavily infected soil and increased the percentage of germination, while by thoroughly wetting the soil with the prescribed concentration of uspulun the number of germinated seedlings was raised from 13 in the control to 144, all of which grew vigorously and remained free from the disease throughout the experiment. Dusting the soil with uspulun was less effective, the corresponding plot producing only 73 plants, of which 5 were diseased.

VAN KEULEN (K.). **De vallersziekte.** [Drop disease.]—*Floralia*, xlvii, 52, pp. 819–820, 1926.

A brief account is given of the symptoms and etiology of drop or blackleg of cabbage (*Phoma oleracea*) [*P. lingam*: *Phytopath.*, viii, p. 379, 1918] which is stated to cause very severe damage in northern Holland, where intensive cultivation is practised on a wide scale. Red cabbage is more susceptible to blackleg than the Savoy varieties. Control measures should include the extermination of the cabbage fly [*Phorbia brassicae*], known to be the cause of wounds by which the fungus enters, disinfection of the seed-beds with formalin, and rotation of crops; the rot which the fungus produces in stored cabbage may be avoided by storage at low temperatures and at a low degree of humidity.

DUFRÉNOY (J.) & SZYMANEK (J.). **Une maladie bactériénne du Chou.** [A bacterial disease of Cabbage.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 249–258, 6 figs., 1926.

A description is given in this paper of a bacterial disease of cabbage observed in the region of Mareil-Marly, Fourqueux, and Chambourcy (Seine-et-Oise) since August, 1925, though it is stated the disease undoubtedly occurred in France earlier than this.

The disease appears in the form of a yellowing of the leaves and a blackening of the leaf veins. A necrosis of the vascular bundles, and in some cases of the parenchyma, was visible in cross sections of the petiole or stem.

From the infected tissues a bacterium was isolated which corresponds very closely to *Bacterium campestre* [*Pseudomonas campestris*] and positive results were obtained by inoculations with this organism on the young leaves.

Plants only slightly attacked may become completely destroyed if kept in store. The disease is easily transmitted by seed, by plants transplanted from one district to another, by field implements, boots, or farmyard manure. An adequate rotation of crops is recommended and all wild Cruciferae should be eradicated, as these are equally susceptible to attack. Disinfection of seed with formalin solution is also advised.

In the addenda it is noted that a careful comparative study of this organism has been made at the Imperial College of Science and Technology, London, where it was concluded that the French species is not identical with *P. campestris* though the reactions are extremely similar.

SZYMANEK (J.). **Une maladie du Chou-fleur du nord de la France.** [A disease of the Cauliflower in northern France.]—*Rev. Path. Vég. et Ent. Agric.*, xiii., 4, pp. 259–261, 1926.

Further investigations have recently been made by the author on the etiology of the bacterial rot of cauliflowers which caused severe damage in France until 1914 when the cultivation was interrupted by the war, and which has recently reappeared and again threatens the industry [*R.A.M.*, v, p. 271]. Delacroix in 1904 attributed the disease to a new species which he named *Bacillus brassicaevorus* and Griffon later isolated a similar organism in his studies on the disease. In every plant examined by the author during 1926, however, a large number of larvae of *Contarinia torquens* were found in the leaves, and it is concluded that the bacteria associated with the rot are not truly pathogenic organisms, but have been introduced into the host through the wounds made by these insects.

BÖNING (K.). **Die Mosaikkrankheit der Rübe.** [Mosaic disease of the Beet.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxvii, 1–2, pp. 19–25, 1927.

The mosaic disease of beets is stated to be widespread in Germany on all the cultivated varieties of the crop, and to be particularly prevalent in the sugar beet growing regions of the valley of the Rhine [see also *R.A.M.*, vi, p. 266]. A detailed account is given of the symptoms, and of the histological and functional

troubles caused by the disease in the plants. Field observations have shown that beets may be infected at all stages of their development, but that infection generally occurs in June on the current year's seedlings. Experiments directed towards establishing the mode of transmission showed that the chief carrying agent is the black aphis (*Aphis fabae*), but infection was also secured by grafting pieces of diseased tissue on healthy stocks; it was proved that the soil plays no part in the transmission of the disease. Although no immunity was observed in any of the commercial varieties used in Germany, individual resistance was marked in some strains. Control measures should be directed towards the suppression of the insect carriers, and the breeding of resistant or immune varieties.

CURZI (M.) & BARBAINI (MARIA). **Intumescenze e Cladosporium pisi sui legumi di Pisum sativum.** [Intumescences and *Cladosporium pisi* on pods of *Pisum sativum*.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. III, iii, pp. 91–105, 1 pl., 1926.

In 1890, Cugini and Macchiati recorded a disease of pea pods (*Pisum sativum*) which was attributed to a new species of *Cladosporium* named by them *C. pisi*. The parasitic nature of this disease, which has occurred since in several parts of northern Italy, was accepted until recently, when a study of identical intumescences found on peas growing at Pavia led the authors to conclude that the disease is of an entirely non-parasitic nature. The intumescences originate at the stomata and develop especially near the veins, or in hollows where transpiration is reduced. Cells underlying and bordering the stoma become swollen and elongated, and divide to form a fan-shaped outgrowth which rapidly develops into the intumescence. Atmospheric humidity was found to have a marked effect on this formation, but it is not absolutely essential for its occurrence, while temperature and, to a limited extent, light are also considered to exert some influence.

No parasitic organism was found on the living part of the intumescence, but in the later stages saprophytic fungi, the most frequent being *C. pisi* (which is regarded as a synonym of *C. herbarum*), caused the formation of a dark green coating on the outgrowth.

Although this disease is not of general occurrence and should not be considered as causing much damage, susceptible varieties exist which, under certain conditions, may become seriously affected and the pods are then liable to shrivel up before reaching maturity.

BURKHOLDER (W. H.). **A new bacterial disease of the Bean.**—*Phytopath.*, xvi, 12, pp. 915–927, 1 pl., 3 figs., 1926.

This paper deals with a new blight and wilt disease of the common bean (*Phaseolus vulgaris*) in New York State, caused by a hitherto undescribed bacterium, which is named *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* n. var. The symptoms of the disease, which are described in detail, do not differ materially from those of bean diseases due to *P.* [*Bact.*] *phaseoli* [*R.A.M.*, i, p. 151] and *P.* [*Bact.*] *flaccumfaciens* [ibid., v, p. 463]. The organism was isolated and studied in pure culture and its morphology and cultural

characters are fully described. Its pathogenicity was proved by several hundred inoculation experiments, which were successful in every case except when resistant varieties were used. The results of a further limited number of experiments indicated that the organism is a wound parasite. No infection was obtained on lucerne, in which behaviour the variety differs from *Bact. medicaginis*. Red Kidney beans, including the Wells' strain, and White Kidney were found to be very susceptible to this disease, while White Marrow and the Pea bean were more resistant. Refugee and Scotia also gave a satisfactory resistance. Cross-inoculation tests further showed that the scarlet runner (*Phaseolus multiflorus*) and the Lima bean (*P. lunatus*) are also susceptible to the disease.

KLEBAHN (H.). **Bekämpfung der Selleriekrankheiten.** [Control of Celery diseases.]—*Die Kranke Pflanze*, iv, 2, pp. 19–22, 1 pl., 1 fig., 1927.

The scope of the present note is to bring to the notice of commercial growers a method devised by the author in 1910, and claimed since to have given good results in the neighbourhood of Hamburg, for the control of the two diseases of celery which are stated to be the most common and dangerous to the crop in Germany, namely, a leaf spotting caused by *Septoria apii*, and a scab of the root-stocks caused by *Phoma apiicola* [*R.A.M.*, vi, p. 141]. The method consists in steeping the seed (presoaked for 15 minutes in water) for 24 hours in a solution of 20 gm. copper sulphate to 1 l. of water, and sowing it, after drying slightly, in cold beds previously disinfected with a solution of 0·5 l. of commercial formalin in 12 l. of water per 2 sq. m. surface. This treatment is stated not to impair the germinability of the seed to any appreciable degree.

S[CHENK] (P. J.). **De bladvlekkenziekte der Selderie en nog wat anders.** [The leaf spot disease of Celery and other notes.]—*Floralia*, xlviii, 4 pp. 61–62, 1 fig., 1927.

Much damage is stated to be caused in Holland by the leaf spot disease of celery (*Septoria apii*), of which two forms are distinguished by Laibach, namely, *S. apii* f. *punctiformis* and *S. apii* f. *maculiformis*. The former produces small spots and an abundance of pycnidia, and the latter large spots and few pycnidia. The writer has observed that the tendency to pycnidial formation is stronger in the autumn than in the summer. Bleached celery, especially the White Plume variety, has been found more susceptible than ordinary celery, while celeriac is comparatively resistant. The disease may be controlled by crop rotation; disinfection of the soil with formalin, or with lime in a 10 per cent. solution of sulphate of ammonia; and immersion of the seed in a solution of formalin 1 in 40 for four hours, in corrosive sublimate 1 in 1,000 for half-an-hour (after pre-soaking for the same period), or in 20 per cent. hydrogen peroxide for three hours. During the growing period it may be necessary to spray the plants every three or four weeks with 1 per cent. Bordeaux Mixture.

CURZI (M.). **L'eziologia della 'cancrena pedale' del Capsicum annuum.** [The etiology of foot rot of *Capsicum annuum*.] —*Riv. Pat. Veg.*, xvii, 1–2, pp. 1–19, 5 figs., 1927.

In this paper the author describes his studies on the foot rot disease of chillies (*Capsicum annuum*) previously ascribed to *Phytophthora cactorum* and *P. omnivora* [*R.A.M.*, iv, p. 204].

The fungus which was isolated in pure culture is said to agree more nearly with the *P. phaseoli* group than with *P. cactorum* but, in the author's opinion, does not correspond with any known species and is therefore named *P. hydrophila*, a Latin diagnosis being given. *P. capsici*, which causes a decay of the fruits and branches [*R.A.M.*, ii, p. 101], differs by its flexuous, imperfectly dichotomous, dense branching from *P. hydrophila*, which presents more or less regular monopodial, straight branches; the former also produces abundant aerial conidia while the lesions caused by it develop very slowly and often remain circumscribed.

In water the zoosporangia of *P. hydrophila* are often obpyriform, 50 to 95 by 30 to 50 μ, while those formed in air are usually lemon-shaped, 30 to 60 by 22 to 36 μ. The antheridia are amphigynous. Oospores are not found on the host, but freely develop in special cultures; they are globose, 24 to 29 μ in diameter, with dark brown walls. Conidial fructifications are generally absent, but if the plants are immersed in water, zoosporangia are quickly produced and there is evidence that the disease is spread by water; a single irrigation is said sometimes to result in the complete destruction of the crop. Fields irrigated with surface water appear to be more liable to infection than those irrigated with well water.

Inoculation of healthy plants proved successful in reproducing the characteristic symptoms of the disease. Artificial infection of the fruit and buds resulted in a speedy rotting which spread towards the base of the plant, subsequently affecting the roots in some cases.

DOOLITTLE (S. P.) & WALKER (M. N.). **Control of Cucumber mosaic by eradication of wild host plants.**—*U.S. Dept. of Agric. Bull.* 1461, 14 pp., 3 pl., 1926.

In this bulletin the authors give an account of field experiments carried out during the years 1920 to 1924 in Wisconsin and in Illinois on the control of cucumber mosaic by the eradication of the wild host plants [*R.A.M.*, v, pp. 142, 340].

In the earlier experiments attempts were made to remove all the mosaic host plants occurring in areas of one-half to one square mile, but later an area within 50 to 75 yards from the infected fields proved sufficient, and this permitted all known host species to be removed. The fact that mosaic infection of perennials such as milkweed (*Asclepias syriaca*) and *Physalis* spp. occurred almost entirely on land which had borne cucumbers indicated that these hosts had originally been infected from the cultivated cucurbits and emphasized the importance of rotation of the crop.

The results of the experiments of 1920 to 1922 were inconclusive, owing partly to lack of mosaic infection and partly to the constant discovery of new host plants, but in 1923 and 1924 satisfactory evidence was obtained that the disease can be controlled,

even under difficult field conditions, by this method. At Rockland, Wisconsin, infection was reduced from 39 to 3 per cent. and at Madison, Wisconsin, from 100 to 10 per cent. during the four years under review. On the basis of these results the following recommendations for control are made. Cucumber fields should preferably be surrounded by other cultivated crops, as such fields have been found to be less infected by the insect carriers of the disease. Wild host plants, such as wild cucumber (*Micrampelis lobata*), milkweed, ground cherry (*Physalis* spp.), and catnip (*Nepeta cataria*), should be dug up or the shoots pulled up as fast as they appear, but in the case of pokeweed (*Phytolacca decandra*) it is advisable to cut down as far as possible into the large roots and cover the cut surface with salt.

The first eradication should be made just before planting, and careful inspection carried out subsequently at intervals of 3 to 10 days. Rotation of the cucumber crop and regular spraying or dusting to control the insect carriers of the disease are also recommended.

In conclusion the necessity for co-operation in the work of eradication amongst growers whose fields lie close together is emphasized.

JAGGER (I. C.). **Powdery mildew of Muskmelons in the Imperial Valley of California in 1925.**—*Phytopath.*, xvi, 12, pp. 1009–1010, 1926.

An outbreak of powdery mildew of muskmelon [*Cucumis melo*] occurred in 1925 in the Imperial Valley of California where large quantities of this fruit are grown. Owing to the very dry, sunny climate and isolated position surrounded by deserts, the melons in this area have never been subject to fungous or bacterial diseases, and mildew has never before been recorded. The outbreak started when the harvest was beginning (10th May), and spread rapidly. The first or main set of melons was but little damaged, and the reduction in yield was estimated at only 15 per cent. All varieties grown in the Valley were affected and the various fungicides tried were unsuccessful in controlling the outbreak. The perfect form of the fungus was not found but the organism is stated to be in all probability *Erysiphe cichoracearum*, the species usually found on cucurbits.

In a footnote the author adds that in 1926 the disease appeared earlier and was more destructive than in 1925, a reduction in yield of 25 per cent. being recorded.

RIVES (L.). **Sur la phagocytose chez le 333 E. et sa résistance au court-noué.** [On phagocytosis of 333 E and its resistance to court-noué.]—*Prog. Agric. et Vitic.*, lxxxvii, 6, pp. 139–140, 1927.

With reference to the resistance of the variety 333 E of the vine to court-noué [*R.A.M.*, iv, p. 331], the author, who has made a study of the roots of this variety, states that there is a direct relationship existing between the disease and the absence of the endotrophic mycorrhiza [*R.A.M.*, iii, p. 501]. The intercellular mycelium and vesicles of the endophyte, which are so abundant in susceptible

vines, very rarely occur in the variety 333 E, and where the fungus was found it showed obvious signs of degeneration. The author has also observed numerous crystals of calcium oxalate in the roots of this variety, and though the cortical tissues of roots containing calcium oxalate may be readily invaded by the endophyte, it is none the less true that this substance appears to have a detrimental effect upon mycorrhizal development.

D. (L.). **Traitement de la fumagine.** [Control of sooty mould.]—*Prog. Agric. et Vitic.*, lxxxvii, 4, pp. 91–94, 1927.

Sooty mould [*Capnodium salicinum*] of the vine is stated to be propagated on the sugary excretions of various species of scale insects which live on this host. It is injurious to the vine only inasmuch as it prevents the regular respiration of the organs attacked, and is best controlled by all measures directed towards the extermination of the insects, a number of which are briefly described in the present paper.

Ravaz (L.). **L'Oïdium.** [*Oidium.*]—*Prog. Agric. et Vitic.*, lxxxvii, 7, pp. 153–157, 1 col. pl., 1927.

The author gives a popular description of the *Oidium* [*Uncinula necator*] of the vine as it occurs in France, and discusses the relative values of the control treatments practised. Winter applications of sulphuric acid, iron sulphate, or potassium permanganate after pruning are sometimes given against the perithecial stage, which occasionally develops, but the author has not found their use satisfactory. The fungus also overwinters in the buds where it cannot be destroyed, but the *Oidium* stage, which is prevalent from spring to autumn, is readily controlled. The substance mostly employed is sulphur, either ground or sublimed, the latter being the more active, though sulphur can also be applied in the form of a vapour, in colloidal solution, as 'black sulphur' [*R.A.M.*, iv, p. 461], or as polysulphides. Three treatments are usually given, (1) when the shoots are about 15 cm. long; (2) at the flowering period, and (3) about June or July, according to the district. If conditions are especially favourable to the disease, additional applications may be required. Attention is drawn to the necessity of using an adequate quantity of sulphur; the minimum requirement is said to be 100 kg. per hect., though up to 200 kg. may be applied if the disease is very active.

Gram (E.) & Thomsen (M.). **Oversigt over Sygdomme hos Landbrugets og Havebrugets Kulturplanter i 1925.** [Survey of the diseases of agricultural and horticultural cultivated plants in 1925.]—*Tidsskr. for Planteavl*, xxxiii, 1, pp. 84–148, 6 figs., 1 map, 1927. [English summary.]

This report, prepared on the same lines as those of former years, [*R.A.M.*, iv, p. 715], contains numerous references of phytopathological interest, of which the following may be mentioned.

Stripe disease of barley (*Pleospora graminea*) appears to be decreasing in Denmark, partly as the result of more general and systematic seed treatment. Net blotch (*P. teres*) caused considerable damage on the Prentice and Princesse varieties. Covered smut of

barley (*Ustilago hordei*) appears to be on the increase. Yellow rust of wheat (*Puccinia glumarum*) developed early and caused heavy losses, especially among the Panser, Ridder, and Trifolium varieties. Oats were attacked in several districts by *Septoria avenae* and *S. graminum*, the former producing dark, and the latter grey spots.

Foot rot of clover (? *Fusarium redolens*) occurred sporadically under conditions strongly suggesting soil infection. American and Canadian varieties of alsike [*Trifolium hybridum*] were severely infected by downy mildew (*Peronospora trifoliorum*), which was less prevalent on Swedish and German clovers.

Mosaic disease occurred extensively among first-year beets. In the dry summer, dry rot (*Phoma betae*) was very prevalent on calcareous soils [ibid., iv, p. 522]. The withering of the outer, and blackening of the inner leaves was most conspicuous in August, the plants (except the highly susceptible fodder sugar beets) recovering in September.

During the winter of 1924–5, 20 to 40 per cent. of certain varieties of turnips (chiefly Studsgaard and Lyngby Bangholm) were destroyed by brown rot (*Bacterium campestre*) [*Pseudomonas campestris*], which caused no injury to small-stemmed varieties. Mosaic of turnips was found in a few fields in seed producing districts. Swedes, especially of the Klank and Olsgaard varieties, were extensively and severely attacked by dry rot (*Phoma napobrassicae*), which in one case appeared to be transmitted by the seed.

Leaf roll of potatoes was widely recorded, the incidence in one locality increasing from 10 per cent. in 1924 to 30 per cent. in 1925. Mosaic disease is stated to be even more prevalent than leaf roll, but its effects are less pronounced. Aucuba mosaic and stipple streak [ibid., vi, p. 114] were also reported, the latter occurring in a mild form on the Juli and Magnum Bonum varieties.

Wart disease (*Synchytrium endobioticum*) was reported from six fresh localities, making 20 centres of infection in all. A regulation of 5th November, 1925, provides for the control of this disease by the cultivation of resistant varieties and restricts the use of material from infected gardens.

Choke (*Epichloë typhina*) was unusually prevalent among fodder grasses.

Septoria piricola is stated to occur every year on certain pear varieties. *Pyrenochaete furfuracea* was found on the Nouveau Poiteau variety.

Cane blight of raspberries (*Didymella applanata*), associated with *Coryneum ruborum* and *Fusarium* (? *salicis*) [ibid., iii, p. 507], caused considerable damage. At Lyngby the Superlative and Goliath varieties were chiefly affected.

Tomatoes at Lyngby were infected by *F. erubescens*, which entered through the style or through the stem after picking and caused the decay and shrivelling of the fruit. This is stated to be the first Danish record of the disease, which has been severe near Berlin and may be controlled by spraying with Bordeaux mixture.

Puccinia phragmitis was observed on different varieties of rhubarb.

Box [*Buxus*] hedges were attacked by *Nectriella rousselliana*. *Phlox decussata* was infected by *Septoria phlogis*.

Adequate disinfection of tulip bulbs attacked by *Botrytis tulipae* [ibid., iv, p. 285] was secured by immersion in 2 per cent. copper sulphate, followed by planting out in new beds.

A wilt of asters [*Callistephus chinensis*], characterized by rotting of the stem bases, was associated with the profuse occurrence of a species of *Fusarium* [ibid., v, p. 491].

A number of the preparations discussed in the section on disease control have already been mentioned [ibid., v, p. 560]. Two German sulphur preparations, B. and BA. 12 (Magdeburg), were successful in the eradication of mildew on roses (*Sphaerotheca pannosa*), cucumbers (*Erysiphe cichoracearum*), and gooseberries (*Microsphaera grossulariae*). Nosperit [ibid., vi, p. 77] was very effective against cucumber mildew and moderately so against late blight of tomatoes (*Phytophthora infestans*).

LINSBAUER (L.). **Botanisches Versuchslaboratorium und Laboratorium für Pflanzenkrankheiten.** [Botanical experimental laboratory and laboratory for plant diseases.]—*Ber. über die Tätigkeit der Bundes- Lehr- und Versuchsanst. für Wein-, Obst- und Gartenbau in Klosterneuburg für die Jahre 1919–20 bis 1924–25*, pp. 26–42, 1925. [Received April, 1927.]

The following references in this report of the experiment station at Klosterneuberg [Austria] are of phytopathological interest. Black rot of apples (*Monilia*) [*Sclerotinia*] was observed to be greatly dependent on the nature of the fertilizers applied to the soil, and experiments in the prevention of the disease by regulating fertilizing were initiated. In 1923 the fruits of *Malus* [*Pyrus*] *baccata* were heavily attacked.

Cedar rust of pears (*Gymnosporangium sabinae*) was successfully controlled by spraying the under side of the leaves with a copper mixture, whilst trees sprayed on the upper surface of the leaves or not at all were strongly attacked.

Chestnut (*Castanea vesca*) trees in Burgenland were affected in 1921 and 1922 by a wilt disease, associated in some cases with heavy fungous infection of the roots, while in others no trace of a parasite was observed. The phenomenon is tentatively ascribed to the excessive drought of 1922 [see also *R.A.M.*, iii, p. 70], the fungi being probably of secondary importance. A possible connexion with ink disease [*Phytophthora cambivora*: see below, p. 380] should be investigated.

In May, 1922, *Monilia* [*Sclerotinia*] *linhartiana* was observed on *Mespilus* leaves which smelt strongly of coumarin. Various ornamental plants, e.g. *Tradescantia*, *Campanula*, and *Datura arborea* were attacked by a fungus forming a slender, white mycelium, which was identified as *Botryosporium longibrachiatum*. A species of *Sporodesmium* occurred on vegetable marrows in 1923.

Cherries of the Grosse lange Lot variety growing close to a thick hedge were attacked by *Venturia cerasi*, which was evidently favoured by the damp atmosphere and subdued light.

SACKETT (W. G.). **Report of Bacteriologist.**—*Thirty-ninth Ann. Rept. Colorado Agric. Exper. Stat. for the year 1926*, pp. 14–18, 1926. [Received April, 1927.]

The following items of phytopathological interest occur in this

report. Of the 45 bacterial cultures isolated from lucerne [*Medicago sativa*] affected by wilt and root rot [*R.A.M.*, v, p. 538 and next abstract] 19 were identified as *Aplanobacter insidiosum* (L. McC[ulloch]) [ibid., v, p. 36].

An actively motile, sporulating bacillus is responsible for a new disease of green tomatoes, manifested as a soft, black rot of the fruit, which has caused heavy losses in the Denver commercial greenhouses.

A very appreciable reduction in the number of bean plants affected by bacteriosis [*Bacterium phaseoli*] in the Arkansas Valley was effected by the use of two-year-old instead of one-year-old seed.

[Durrell (L. W.)]. **Report of Botanist.**—*Thirty-ninth Ann. Rept. Colorado Agric. Exper. Stat. for the year 1926*, pp. 18–26, 1926. [Received April, 1927.]

This report contains the following references of phytopathological interest. The death of lucerne plants suffering from root rot [*Aplanobacter insidiosum*: see preceding abstract] was found to be due to lack of water through obstruction of the water ducts by a pentosan gum. The water supply is reduced to one-fourth of the normal, resulting in wilting and failure of starch production.

Trials in the control of wheat bunt [*Tilletia tritici* and *T. levis*] were carried out on 2,500 plots in five localities. Copper carbonate was found to be superior to formalin, copper sulphate, germisan, uspulun, and other commercial compounds for the control both of wheat bunt and smut of hull-less barley and oats [*Ustilago hordei* and *U. avenae*].

Brown (J. G.) & Gibson (F.). **Plant Pathology.**—*Thirty-fourth Ann. Rept. Arizona Agric. Exper. Stat. for the year ended June 30th, 1923*, pp. 498–506, 3 figs., 2 graphs, [? 1926].

Efforts were made during the year to initiate a plant disease survey of the State and a résumé of this work is given. Crown gall [*Bacterium tumefaciens*] and Texas root rot [*Phymatotrichum omnivorum*] were the most prevalent diseases throughout the area under observation, the former on fruit trees and grape vines, and the latter on cotton, fruit and shade trees, privet, lucerne, and other plants. Of other diseases recorded, scab [*Actinomyces scabies*] and black scurf [*Corticium solani*] of potato are said to have been introduced on seed; lettuce slime [*R.A.M.*, iii, p. 566] occurred wherever lettuce was grown and experiments showed that the disease results from soil and not seed infection; canker (*Cytospora* [*chrysosperma*]) of cottonwood [*Populus deltoides*] and poplars [*Populus* spp.] was widely distributed; and wilt (*Fusarium*) of chilli pepper [*Capsicum annuum*] was troublesome in one locality.

Continued experiments on the sterilization of cotton seed [ibid., v, p. 82] showed the superiority of sulphuric acid over 75 per cent. wood alcohol and corrosive sublimate for this purpose. The first-mentioned has advantages in being cheap, in rendering the seed easy to handle, in allowing a high percentage of germination, and in shortening the germination period by 1 to 5 or more days.

Further experiments were carried out on the effect of alkali soil on the prevalence of angular leaf spot of cotton (*Phytomonas mal-*

vaceara) [*Bacterium malvacearum*: ibid.]. In plots where the percentage of sodium chloride and sodium carbonate varied from 0·253 to 0·825, the number of infected plants raised from seed soaked in a virulent culture of the organism increased to a maximum of 38 per cent. two months after planting. A subsequent decrease was followed by a second increase coinciding with the beginning of the summer rains. In alkali-free soil the percentage of infected plants was 67 about a month after planting. A similar decrease and increase occurred as in the first case. In pots in a screened garden the percentage of affected plants in soil containing 0·4 per cent. of sodium chloride was 44, as against 68 per cent. in alkali-free soil. A decrease of infection occurred as before, due chiefly to the shedding of the cotyledons. Summer rains and insects seemed to have no effect in spreading the disease in the sheltered garden. Stem infection frequently resulted from the movement of bacteria through the petioles of infected cotyledons.

Defoliation of mesquite trees [*Prosopis juliflora*], apparently caused by *Scleropycnium aureum*, and a scalding of citrus trees were observed.

MELCHERS (L. E.). **Economic plant diseases common in Kansas and their control.**—*Kansas Agric. Exper. Stat. Circ.* 129, 23 pp., 1926.

In this paper the principal fungous, bacterial, and physiological diseases of economic crops in Kansas are presented in tabular form in alphabetical order of the hosts, with brief notes on the most conspicuous symptoms and on control measures. Directions are given for the preparation and application of some standard dusts and liquid sprays.

RUSSELL (H. L.), MORRISON (F. B.), & EBLING (W. H.). **Gleanings from science.**—*Ann. Rept. Wisconsin Agric. Exper. Stat. 1924–1926* (*Bull.* 388), 145 pp., 36 figs., 3 diags., 1 graph, 1926. [Received March, 1927.]

The following references of phytopathological interest [in addition to those already noticed from other sources] are scattered through this report. By the indexing method, it was ascertained that the incidence of potato mosaic on most of the rogued plots did not exceed 3 per cent., though in the parent seed stocks infection ranged from 15 to 40 per cent. These results denote that continued reindexing of the improved stock will effect a further reduction of mosaic.

Dusting potatoes for the control of pests and diseases is stated to be superseding spraying, although in four years' experiments the latter process gave higher yields. A strain of tobacco (Havana 142) has been developed which combines the high yielding and other desirable characters of the Havana varieties with resistance to root rot [*Thielavia basicola*].

In addition to the Wisconsin Hollander, Wisconsin All Seasons, and Wisconsin Brunswick varieties of cabbage resistant to wilt [*Fusarium conglutinans*: *R.A.M.*, v, pp. 458–459], three new mid-season varieties have been developed, namely, All Head Select,

Marion Market, and Globe, all of which will be available for general use in 1927.

The best control of barley stripe [*Helminthosporium gramineum*] during three years' trials was given by one hour's immersion in 0·5 per cent. germisan, while uspulun and semesan were also satisfactory at relatively high concentrations. The barley smuts [*Ustilago nuda* and *U. hordei*] may also be controlled by this seed treatment and sowing in moderately cool, damp soil.

The grain rusts, including stem rust (*Puccinia graminis*) and leaf rust (*P. triticina*), are stated to have caused greater losses in Wisconsin cereal crops than all other diseases combined. The eradication of the common barberry [*Berberis vulgaris*] is progressing satisfactorily, with the result that outbreaks of stem rust now only occur locally. In 1924 this rust started in fields adjacent to a large barberry area and caused heavy losses. About 30 other localities in the State showed a similar connexion between infected barberry bushes and the spread of rust.

Studies on the overwintering of stem rust were made on winter wheat, rye, and perennial grasses. Some 1,500 plants bearing uredosori were observed throughout the winter. The germination of the spores remained high (30 to 40 per cent.) until after January, when it rapidly sank, reaching zero by 1st March [see also *R.A.M.*, v, p. 351]. Several hundred tests in March and April confirmed previous data to the effect that the uredospores of *P. graminis* do not survive the winter season under Wisconsin conditions.

In connexion with studies on the nature of resistance of certain strains of spring wheat to *P. triticina* [ibid., v, p. 725], the rust was found to enter the stomatal cavity in both resistant and susceptible varieties. In the latter, however, the haustoria of the fungus penetrate the cell wall and give rise to mycelial growth, while in the former the mycelium often scarcely develops beyond the infection vesicle. In other cases the haustorium kills the host cell with the result that the fungus also dies.

Serious damage is caused to the important canning bean industry of Wisconsin by bacterial blight [*Bacterium phaseoli*: *R.A.M.*, i, p. 151] which may attack the pods, invade the seeds, and finally infect the young seedlings; or it may spread gradually over the fields, producing a rusty and ragged appearance of the foliage from midsummer onwards. Yellow pod varieties (especially Wardwell Wax) are particularly susceptible. Kidney Wax, however, is relatively resistant, while the green pod varieties (except Dwarf Horticultural) are little affected.

Mosaic of beans is also of common occurrence in Wisconsin, the standard green canning variety, Rogers's Stringless Green Pod, being particularly susceptible.

Twenty-fifth Annual Report of the Bureau of Agriculture, Philippine Islands, for the fiscal year ending December 31, 1925.—123 pp., 31 pl., 13 graphs, 1926.

The following items of interest [other than those already noticed from different sources] occur in the section of this report dealing with plant diseases (pp. 62–72).

Abaca [*Musa textilis*] in the Samar district was attacked by a species of *Marasmius* and by mosaic, and a brown leaf spot disease was reported from Mindoro. An account is given of the work in connexion with the survey of the highly destructive heart rot and bunchy top of abaca [*R.A.M.*, vi, p. 174 and below, p. 359] in the Philippines. Bunchy top has been observed in two municipalities of Tayabas Province, namely, Sampaloc and Mauban, and Administrative Order No. 45 was amended to include these two localities [ibid., iii, p. 751]. Bananas in Laguna were infected by abaca heart rot and bunchy top.

Maguey (*Agave cantala*) was attacked by anthracnose (*Colletotrichum agaves*) and by mosaic or yellow spot of undetermined origin, which also affected sisal (*A.* [*rigida*] *sisalana*). Henequen hemp (*A. fourcroydes*) [*A. rigida*] suffered from a blight due to a species of *Helminthosporium*.

Artificial inoculation experiments with a species of *Thielaviopsis* (probably *T. paradoxa*) and *Phytophthora* isolated from coco-nut palms affected by a serious disease known as nut fall gave positive results. Comparative inoculations on coco-nut fruits with *T. paradoxa* obtained from a plant showing symptoms of stem bleeding were also successful.

A species of *Phyllosticta* was found on the leaves of 15 one-year-old coco-nut palms. The disease was controlled by two applications of lime-sulphur 1 to 39.

The *Fusarium* wilt of tobacco (*F. oxysporum*) first studied in 1924 [*R.A.M.*, v, p. 283] was found to be most severe on the Piniña and Batoc varieties. Infection was readily produced during hot weather accompanied by high soil temperatures.

Atis (*Anona squamosa*) was attacked by *Colletotrichum* sp. (possibly the conidial stage of *Glomerella cingulata*), *Erysiphe* sp., and *Lasiodiplodia theobromae* [*Botryodiplodia theobromae*], the last-named occurring on the fruits.

Other miscellaneous records included *Guignardia arecae* on betel nut [*Areca catechu*], *Cercospora manihotis* [*C. cassavae*] on cassava [*Manihot utilissima*: *R.A.M.*, v, p. 144], *Helminthosporium inconspicuum* [*H. turcicum*] on maize, and *Asterinella stuhlmanni* on pineapple.

A species of *Nectria* was found constantly associated with a serious foot rot of ornamental plants, including *Hibiscus achizopetalus*, *Graptophyllum pictum*, and *Acalypha tricolor*.

TEUTSCHLÄNDER & KRONENBERGER (F.). **Ueber Versuche mit Bacterium tumefaciens.** [On experiments with *Bacterium tumefaciens*.]—*Zeitschr. für Krebsforsch.*, xxiii, 3, pp. 177–182, 1926.

An account is given of the writers' attempts to induce the formation of tumours in mice and rats by inoculation with a strain of *Bacterium tumefaciens* which caused the development of crown gall in *Pelargonium* plants. All the experiments gave negative results, even when the bacterial cultures received an admixture of diatomaceous earth and of oedematous liquid from cancer lesions. It is concluded that, although certain bacteria of the *tumefaciens*

group may occasionally play a part in the development of cancerous growths, this property is not common to the entire species and may even vary within a single strain. There is thought to be absolutely no justification for the sensational statements in the press to the effect that *Bact. tumefaciens* is a specific universal agent of cancer both in plants and animals. The view that *Bact. tumefaciens* is the carrier of an ultramicroscopic virus [*R.A.M.*, v, p. 83] is also rejected.

REICHERT (F.). **Immunisierungsversuche an Ratten gegen die bacillogenen Tumoren von Blumenthal.** [Immunization experiments on rats against Blumenthal's bacterial tumours.]—*Zeitschr. für Krebsforsch.*, xxiv, 3–4, pp. 255–259, 1927.

An account is given of the author's successful experiments in the immunization of rats against Blumenthal's strain (P. M.) of *Bacterium tumefaciens* [*R.A.M.*, iv, p. 727] by inoculation with (*a*) strains of the tumour-forming bacteria, (*b*) fragments of the spleen of inoculated animals, and (*c*) portions of the tumour-mass itself. The virulence of all these forms of inoculum was first weakened by various treatments, and in each case some degree of immunization against subsequent inoculation with a highly virulent strain of the organism was achieved by subcutaneous injections. A very high degree of immunization was further secured by inoculating certain [unspecified] living, normal organs, only 5 per cent. of the animals so treated succumbing to subsequent inoculation with *Bact. tumefaciens* compared with 85 per cent. in the control series. These results are regarded as of great significance in connexion with the therapeutical treatment of human cancer.

KAUFFMANN (F.). **Zur Erzeugung von Pflanzengeschwülsten durch die aus Mäusecarcinomen isolierten T-Bakterien.** [On the production of plant tumours by T bacteria isolated from carcinomata in mice.]—*Zeitschr. für. Krebsforsch.*, xxiv, 3–4, pp. 260–262, 3 figs., 1927.

Five out of ten sunflower [*Helianthus annuus*] plants inoculated with a bacterial strain (T), closely resembling *Bacterium tumefaciens*, isolated from carcinomata in mice developed large tumours on the stalks. Similar results were obtained with *Bact. tumefaciens* and with Blumenthal's P.M. strain [see preceding abstract], but two other T strains (16 and 20) from carcinomata in mice gave negative results. The writer failed to reisolate the organism from the infected sunflower plants.

PEYRONEL (B.). **Il 'mal del piede' dei cereali.** [Foot rot of cereals.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 285–336, 1926.

The author discusses in considerable detail, with numerous bibliographical references, the general signification of the term 'foot rot' of cereals. He distinguishes two groups of fungi associated with this disease, namely those producing black mycelial formations at the base of the culm (*Ophiobolus herpotrichus, O. graminis*, and *Leptosphaeria herpotrichoides*), and those causing a characteristic brown

discoloration (*Fusarium* and *Helminthosporium* spp., though the latter is but little known in Europe). Several species of *Fusarium* have been isolated from cases of foot rot of wheat in Italy; those so far identified are *F. culmorum*, *F. monilioides*, *F. graminearum* (conidial stage of *Gibberella saubinetii*), and *F. poae*. The last species, which most often attacks the undeveloped ears, was met with frequently in the spring of 1925, less often in 1926 [*R.A.M.*, v, p. 732]. A species of *Rhizoctonia*, possibly a simple variation of *R. solani* but not yet identified, was also found at the base of the culm and on roots affected by foot rot. On other specimens examined in 1926, a somewhat unusual form of disorganization of the tissues was observed, associated with a superficial fungus, probably a Hymenomycete or Gasteromycete, together with bacteria, though frost is suspected of being the primary cause of the trouble.

In southern Italy *Fusarium* spp. are stated to be particularly virulent, and *O. graminis* and *L. herpotrichoides* are relatively rare. In the Rome province, *O. graminis* is fairly widespread, and several severe cases are reported every year; *L. herpotrichoides* is not infrequent and is sometimes associated with the former, while cases of *Fusarium* also occur. In the northern provinces all three fungi are of common occurrence, though information is lacking for Piedmont, except in the Waldenses Valley where *Leptosphaeria* and *Fusarium* are prevalent on wheat in particular but also on rye, while *Ophiobolus* has not yet been observed. Almost invariably, plants attacked by *O. graminis* or *L. herpotrichoides* at the foot show a certain number of individuals also attacked by *Fusarium* or *Rhizoctonia*, and frequently other parasitic fungi, e.g., *Puccinia* spp., *Erysiphe graminis*, and *Septoria* spp., appear to predispose the plants to attack. The author considers that atmospheric conditions, soil moisture, and the like play an important part in producing the disease and that *Ophiobolus*, *Leptosphaeria*, *Fusarium*, and *Rhizoctonia* may be purely secondary factors. His observations in recent years confirm the hypothesis that species of *Rhizoctonia* and *Fusarium* on wheat and rye, which are normally innocuous, can behave as more or less virulent parasites under certain conditions [*R.A.M.*, iii, p. 538].

The occurrence of *O. herpotrichoides* or of a similar form on decaying organs of wild plants is recorded. In several parts of the Waldenses Valley, a mycelium was found at the base of the culm of *Calamagrostis arundinacea*, presenting all the characteristics of that of *L. herpotrichoides*, frequently accompanied by ellipsoid lesions with a dark red or brown border. Other similar cases occurred on *Dactylis glomerata*, and also on *Convallaria majalis* and *Allium oleraceum*, though it is questionable whether the fungus is parasitic in these cases.

The following recommendations for the control of the disease are given: disinfection of seed; wide spacing; growing of strains producing few tillers; cultivation of varieties resistant to lodging; ample drainage (this is especially important in the prevention of foot rot caused by *Ophiobolus* and *Fusarium*); adequate manuring without excessive nitrogenous applications; careful rotation of crops; and avoiding the accumulation of stubble.

PASSELÈGUE (G.). **Le VIe Salon de la machine agricole.** [The sixth agricultural machinery exhibition.]—*Journ. d'Agric. Prat.*, xci, 8, pp. 151–152, 1927.

At the sixth annual exhibition held in Paris under the auspices of the Minister of Agriculture by the Association of Exhibitors of Agricultural Machinery and Implements, new apparatus for spraying sulphuric acid to control fungous diseases on cereals [foot rot caused by *Leptosphaeria herpotrichoides* and *Ophiobolus graminis*: *R.A.M.*, v, p. 662] included an air pump (the 'Le Vendéen' spray) shown by the firm of Progrès, of La Roche-sur-Yon, Vendée, and one by Hardy & Gravelat of Mainvilliers-Chartres, Eure-et-Loire; diaphragm pumps by the firm of Castaing, Bordeaux, and by a number of other manufacturers; and other types of apparatus by Messrs. Vermorel, of Villefranche, Rhône, and by Triboulois of Saint-Quentin, Aisne.

DORPH-PETERSEN (K.). **Beretning fra Statsfrøkontrollen for det 55 Arbejdsaar fra 1 Juli 1925 til 30 Juni 1926.** [Report of the State Seed Testing Service for the 55th year of activity from 1st July, 1925 to 30th June, 1926.]—*Tidsskr. for Planteavl*, xxxiii, 1, pp. 1–83, 1927.

Section VI of this report (pp. 57–65) contains the following references of phytopathological interest. Traces of loose smut of barley [*Ustilago nuda*] occurred in 21 of the 32 samples examined. In the 8 samples of barley dusted with various new mercurial preparations, not a single individual among the 15,000 plants was infected by stripe disease [*Helminthosporium gramineum*].

Of the 500 barley fields in Zealand inspected for stripe disease, 34 per cent. were entirely healthy and in 41 per cent. there was under 2 per cent. of infection; only 9 per cent. showed over 5 per cent. of stripe disease. The Guld variety, as usual, suffered most severely, while the cross-rowed types were least affected.

U. hordei, *U. perennans*, *U. bromivora*, and *Tilletia holci* occurred in samples of barley, oat grass [*Avena elatior*], brome grass [*Bromus*], and soft grass [*Holcus*], respectively.

DILLON WESTON (W. A. R.). **The incidence and intensity of Puccinia glumarum Eriks. and Henn., on Wheat infected and non-infected with Tilletia tritici Winter, showing an apparent relationship between the susceptibility of Wheat plants to yellow rust and to bunt.**—*Ann. of Appl. Biol.*, xiv, 1, pp. 105–112, 1 graph, 1927.

These observations were carried out at the University Farm, Cambridge, during the season 1925–26. In the first experiment, bunted plants of Little Joss, a variety of wheat resistant to yellow rust (*Puccinia glumarum*), were found to be badly rusted. Data giving the intensity of attack of both diseases suggested a definite correlation between the incidence of yellow rust and bunt (*Tilletia tritici*). The relationship was confirmed by a second experiment in which plots of the same variety were sown with seed which had received various treatments, and been contaminated at varying rates with bunt. Thirdly, bunted plants of other varieties of wheat were definitely more rusted than plants free from bunt. The writer

suggests that rust resistance which cannot be destroyed artificially can be broken down by natural contamination of wheat with bunt.

HIEKE (F.). **Die spezifische Wirkung der Kalisalze bei der Bekämpfung des Gelbrostes im Weizen nach Versuchen in der Tschechoslowakei.** [The specific effect of potash salts in the control of yellow rust of Wheat as shown by experiments in Czecho-Slovakia.]—*Ernährung der Pflanze*, xxiii, 3, pp. 38–39, 1927.

The results of experiments in Czecho-Slovakia are reported to show the great value of fertilization with potash as a preventive of yellow rust of wheat (*Puccinia glumarum*). In one instance, the portion of a crop of Kirsche's Ideal wheat receiving a top dressing in the spring of 150 kg. 40 per cent. potassium salt and 100 kg. ammonium sulphate per hect. remained almost entirely free from infection, while the other part, to which only ammonium sulphate was applied, showed heavy infection. Phosphoric acid and lime also tend to counteract the development of yellow rust, which has been observed to occur with particular severity on wheat following clover and other Leguminosae [*R.A.M.*, vi, p. 218]. It is further pointed out that the potash content of the soil is greatly depleted by the extensive cultivation of hops, beets, and potatoes in the districts under observation.

DOERELL (E. G.). **Beiträge zur Frage der Bekämpfung des Gelbrostes. I. Betrachtungen zum Gelbrostproblem und zur Bekämpfung des Gelbrostes durch Düngung.** [Contributions to the problem of the control of yellow rust. I. Observations on the yellow rust problem and on the control of yellow rust by fertilization.]—*Ernährung der Pflanze*, xxiii, 4, pp. 49–52, 1927.

The writer summarizes and briefly comments upon some of the more important contributions to the problem of yellow rust of wheat (*Puccinia glumarum*). The disease is stated to have been very severe of recent years in Czecho-Slovakia [see preceding abstract], especially in the hop-growing districts of Saaz, Podersam, Postelberg, Bilin, and Auscha. The yield per hect. amounts only to 13 to 15 doppelzentner [26 to 30 cwt.] with a hectolitre weight of 73 to 74 kg., compared with 80 to 84 kg. in normal seasons. The Postelberg variety of pedigree wheat appears to be particularly susceptible, while Dobrowitz seed wheat is more resistant.

GÜNTHER. **Beiträge zur Frage der Bekämpfung des Gelbrostes. II. Beobachtungen über das Auftreten des Gelbrostes in Hessen und seine Bekämpfung durch Kalidüngung.** [Contributions to the problem of the control of yellow rust. II. Observations on the occurrence of yellow rust in Hesse and its control by fertilization with potash.]—*Ernährung der Pflanze*, xxiii, 4, pp. 52–53, 1927.

During the summer of 1926, following an exceptionally mild winter and warm, early spring, yellow rust of wheat (*Puccinia glumarum*) was more prevalent in Hesse-Nassau than at any time

since the severe epidemic of 1891, when the total loss in the German crops amounted to nearly Mk. 418,000,000. Infection was most severe in fields following clover and root crops [see preceding abstracts] owing to the excess of nitrogen and depletion of potash and phosphoric acid in the soil. Fertilization with ammonium compounds reduced the incidence of infection but induced lodging. The greatest resistance was shown by crops growing on soil to which potash and phosphoric acid had been applied, and a number of experiments proved the inadvisability of adding nitrogen to this combination.

MAAS (H.). **Beiträge zur Frage der Bekämpfung des Gelbrostes. III. Die Kalidüngung als Mittel gegen Rost und Lagerfrucht.** [Contributions to the problem of the control of yellow rust. III. Fertilization with potash as a remedy for rust and lodging.]—*Ernährung der Pflanze*, xxiii, 4, pp. 53–55, 3 figs., 1927.

Very heavy damage was caused in Westphalia in 1926 by yellow rust (*Puccinia glumarum*) and lodging of wheat. The value of potash as a preventive of infection was shown in a case of two plots of Strube's Dickkopf wheat, to both of which 2·5 cwt. basic slag per acre was applied before sowing in the autumn, while one received an additional top dressing in the spring of 40 per cent. potassium nitrate at the rate of about 1 cwt. per acre. The weight of 1,000 grains in the former plot averaged 39·62 gm. and the hectolitre weight 82·03 kg., the corresponding figures for the latter being 45·29 gm. and 83·96 kg.

FINGER. **Ein Beitrag zur Gelbrostfrage des Weizens.** [A contribution to the problem of yellow rust in Wheat.]—*Deutsche Landw. Presse*, liv, 1, p. 4, 1927.

Very serious damage was caused in the Darmstadt (Hesse-Nassau) district of Germany in 1926 by yellow rust of wheat [*Puccinia glumarum*], which spared no variety, even among those generally considered resistant. In general, the early ripening, rapidly developing varieties were attacked last but suffered most severely. Some observations were made in connexion with the influence of fertilization on the disease. Although late applications of nitrogen are usually considered to increase susceptibility, the author found that plentiful and uniform applications greatly reduced the incidence of infection but also resulted in lodging and delayed maturity. Liberal applications of potash strengthened the plants and increased their resistance to yellow rust. Mild winters appear to favour epidemics of this disease, which was observed to be much less prevalent in fields where the grain was very thinly sown.

HEGE (H.). **Das Wesen der Gelbrosterkrankung des Weizens.** [The nature of the yellow rust disease of Wheat.]—*Deutsche Landw. Presse*, liv, 6, pp. 71–73, 1927.

After resuming the views of Finger on the problem of yellow rust of wheat [*Puccinia glumarum*: see preceding abstract], the writer presents his own hypothesis of the causation of this disease.

He regards an attack by yellow rust as the outward manifestation of a physiological disturbance of growth in a certain direction. The causes may be different but the disturbance is constantly accompanied by infection, since the spores of the fungus are probably always present on the plants. Where no such disturbance occurs the plants, of whatever variety, remain immune even if the entire surrounding area is affected. Differences in the degree of infection of individual varieties are explicable by their varying reaction to the above-mentioned physiological disturbance. The plants are not attacked until ear formation begins, and unless the physiological disturbance is eliminated before the close of the growing period, remedial measures will be too late, the plants having by this time lost their recuperative power and with it their resistance to rust. The cause of the 1926 epidemic of yellow rust in Germany is thought to be the drought prevailing at the time of the spring sowing.

Two points must be demonstrated in order to confirm the validity of the above hypothesis: firstly, the ubiquity of the yellow rust spores, and secondly, the increasing susceptibility of the plants as maturity advances. After a spell of cold weather in April, temporary symptoms of yellow rust are frequently observed, due to passing metabolic disturbances. At this stage, however, the trouble is readily cured by the application of saltpetre. The physiological nature of the disease is further shown by the fact that mechanical or other injury to the root system of the plants leads to the development of yellow rust in an otherwise healthy crop.

ECKHOLT (O.). **Nochmals: Gelbrosterkrankung des Weizens.** [Further notes on the yellow rust disease of Wheat.]—*Deutsche Landw. Presse*, liv, 9, p. 120, 1927.

The writer agrees with Hege as to the influence of physiological factors on yellow rust of wheat [*Puccinia glumarum*: see preceding abstract] and attributes the metabolic disturbances primarily to the physical and chemical constitution of the soil. In the autumn of 1925 wheat was sown over an area of 0·25 hect. previously used for rye, vetches having been grown as an intermediate crop. Shortly before earing, yellow rust appeared sporadically during a dry spell, attacking the wheat crop to the extent of 50 per cent. Adjacent plots of wheat following beet and potatoes remained almost completely healthy. It was observed that the soil in the affected areas was compact, damp, and cold, while that of the healthy plots was dark, porous, and dry. Evidently in this case the preceding crop, with its influence on the consistency, biological activity, and water content of the soil, exercised the chief influence on the development of infection.

FISCHER (G. J.) & BELMONTE (J.). **La lucha contra los carbones de los cereales. Carbón volante (Ustilago tritici).** [Control of cereal smuts. Loose smut (*Ustilago tritici*).]—*Rev. Asoc. Rural del Uruguay, November, 1926*, pp. 1–15, 6 figs., 2 graphs, 1926.

Cereal crops in Uruguay are stated to be attacked by various

smuts, of which the following are the most important: wheat bunt (*Tilletia tritici* and *T. levis*) and loose smut (*Ustilago tritici*); covered and loose smuts of barley (*U. hordei* and *U. nuda*); covered and loose smuts of oats (*U. levis* and *U. avenae*); and maize smut (*U. zeae*).

The present paper deals chiefly with the loose smut of wheat, which is widespread over the whole of Uruguay, infection varying from 0 to 14 per cent., with an average of 5 per cent. In years of unfavourable weather conditions during the flowering period still higher percentages have been recorded. All hard varieties of wheat were found to be practically immune from the disease, while soft varieties appeared more or less susceptible. In the latter class the American pedigree 44 d variety showed no reduction in susceptibility in selection experiments conducted over a period of ten years.

Extensive experiments on the control of the disease led the authors to adopt a modification of Jensen's hot water treatment of the seed. In their method the seed is presoaked for 4 hours in water at 30° to 40° C., then steeped for 5 minutes in water at 50°, and finally given about 20 immersions of 10 to 20 seconds each in water at 52° to 53°, after which the seed is rapidly cooled in cold water and thoroughly dried. The treatment does not injure the germination of the seed, apart from a slight retardation during the early stages. It is stated that by this treatment the disease has been practically eradicated from the National Cereal Seed Nursery, and its adoption by all growers is strongly advocated. Practical advice is given for the installation of large scale seed disinfection stations, stress being laid on the necessity of a rapid and uniform cooling and drying of the treated seed.

ANTONOFF (S. M.). Поражаемость яровой Пшеницы мокрой головней в зависимости от сроков посева. [Susceptibility of spring Wheat to bunt in relation to the date of sowing.]—Reprinted from *Scient. Trans. Siberian Agric. Acad.*, v, 14 pp., 1926.

After a cursory review of the literature of the subject, the author gives some details of the experiments carried out at the Academy of Agriculture at Omsk [Western Siberia] during 1922 to 1925 with a pure line of *Triticum vulgare* var. *milturum*, in an attempt to determine the effect of sowing spring wheats at various dates on their susceptibility to infection by bunt (*Tilletia tritici*). The sowings were made on three occasions, at intervals of about ten days, during the month of May, and in every case the results indicated that the later the wheat was sown the more rapidly it germinated and this resulted in a corresponding reduction in infection. It was also observed that in later sowings considerably fewer seedlings were killed by infection with the bunt fungus. Observations conducted with the object of ascertaining the effect of the disease on the growth of the plants confirmed the findings of Mourashkinsky [*R.A.M.*, v, p. 352], but no definite correlation could be established between the depressing effect on growth exercised by the fungus and the date of sowing.

LINDNER (M.). **Saatgutveredlung, einschliesslich Beizung, auf genossenschaftlichem Wege.** [Improvement of seed-grain, including steeping, on co-operative lines.]—*Illus. Landw. Zeit.*, xlvi, 34, pp. 430–431, 1926.

An account is given of the writer's experience in connexion with the work of co-operative societies in the production of high-grade seed-grain and its treatment. The co-operative movement is stated to be steadily gaining ground in Saxony, and a number of large scale experiments in the treatment of seed-grain with various fungicides have been carried out. Good results in the control of wheat bunt [*Tilletia tritici* and *T. levis*] have been obtained both with tillantin and höchst dust, the latter being applied by means of the Neuhaus-Eberswalde apparatus. The disadvantages of dusting include the discomfort and even injury frequently caused to workmen, and difficulties in the provision of suitable sacks. It is hoped that further experiments with the 20,000 to 25,000 cwt. of seed-grain produced annually by the co-operative societies will lead to an elimination of these drawbacks.

CASPAR (R.). **Ueber den Einfluss äusserer Faktoren auf den Steinbrandbefall des Weizens.** [On the influence of external factors on the incidence of bunt of Wheat.]—*Kühn-Arch.*, xii, 1926. [Abs. in *Fortschr. der Landw.*, ii, 1, p. 31, 1927.]

After an exhaustive review of relevant literature the writer describes his experiments on bunt of wheat [*Tilletia tritici* and *T. levis*], which he has found to occur more severely on moderately damp than on very dry or very wet soils. Shading increases the risk of infection by prolonging the period of susceptibility. Deep and dense sowing favour the development of bunt, which is less prevalent where comparatively old seed is used, in well loosened soil, and at high germination temperatures. Late sowing of summer wheat enables the development of the plant to outdistance that of the parasite, while warm weather after the sowing of winter wheat acts in a similar manner. The influence of fertilizers was not found to be very marked, but kainit is known to promote the development of infection, while superphosphates, basic slag, and calcium cyanamide impede it.

BODNÁR (J.). **A Hőchst-féle Kusperit porcsávázószer szabadföldi kipróbálása.** [Tests of the Höchst dust kusperit in field experiments.]—*Növényvédelem.*, ii, 8, 1926. [Abs. in *Fortschr. der Landw.*, ii, 5, p. 167, 1927.]

Kusperit [*R.A.M.*, vi, p. 22], used at a concentration of 0·2 per cent., gave excellent results in the control of wheat bunt [*Tilletia tritici* and *T. levis*] in five field experiments in Hungary. The preparation, which contains arsenic and copper, is liable to cause injury to the respiratory system, but this risk may be minimized by the use of closed containers for the seed-grain.

BODNÁR (J.). **A csávázó rézgálicról.** [On the copper sulphates used for seed steeping.]—*Növényvédelem.*, ii, 9, 1926. [Abs. in *Fortschr. der Landw.*, ii, 5, p. 167, 1927.]

Excellent results in the control of wheat bunt [*Tilletia tritici*

and *T. levis*] have been obtained in laboratory and field tests in Hungary by the use of a preparation known as beizkupfervitriol, a crystalline blue powder supplied by the Kupfervitriolfabrik Orion. The effective principle is stated to be a complex mercury compound (primarily potassium mercuric chloride). Beizkupfervitriol is used at a concentration of 0·5 per cent., the seed-grain being immersed for 15 minutes.

BITTERA (N. v.). **Ueber die stimulierende Wirkung einiger Beizmittel.** [On the stimulatory action of certain fungicides.]—*Fortschr. der Landw.*, i, 21, pp. 669–671, 2 figs., 1926.

A series of experiments was carried out at Magyarovár (Hungary) on the stimulatory action on germination of a number of preparations commonly used against wheat bunt [*Tilletia tritici* and *T. levis*]. The best control of the disease was obtained by immersion of the seed-grain in 0·3 per cent. solutions of resinol or formalin, which reduced the incidence of infection from 24·36 ± 12·73 to 0·08 ± 0·04 per cent. Copper sulphate (1 and 2 per cent.), tillantin (0·2 per cent.), higor (0·1 per cent.), kusperit or trockenbeize höchst (0·2 per cent.), and porzol II dust (0·3 per cent.) also gave satisfactory results. Both formalin and resinol produced an adverse effect on germination. Copper sulphate (0·5 and 1·0 per cent.) did not result in any injury and in the case of the weaker solution stimulated germination; a 2·0 per cent. solution, however, had a retarding effect. The writer concludes that the whole question of seed stimulation needs further elucidation before the process can be of any practical use.

M. (A.). **Heidemoorkrankheit.** [Reclamation disease.]—*Deutsche Landw. Presse*, liii, 52, p. 659, 1926.

A further report on the results of experiments in the control of the reclamation disease of oats and other cereals by applications of copper sulphate [*R.A.M.*, vi, p. 51] has now been published by the Groningen (Holland) Experiment Station. The copper sulphate should be applied in a crystalline state shortly before or after sowing at the rate of 50 kg. per hect. (or 100 kg. if the soil contains more than 8 per cent. of humus). It may be used in combination with Chile saltpetre, sulphate of ammonia, or potash salts, but not with superphosphates or calcareous fertilizers. The copper sulphate may also be mixed with damp soil to facilitate distribution.

LAUBE (W.). **Der Fusariumbefall der jetzigen Roggenernte.** [The *Fusarium* infection of the current Rye harvest.]—*Illus. Landw. Zeit.*, xlvi, 34, pp. 428–430, 5 figs. (3 on p. 431), 1926.

Discussing the prospects of the 1926 harvest in Germany, the writer draws attention to the risk of serious loss from *Fusarium* disease [*Calonectria graminicola*: *R.A.M.*, vi, p. 89], which in 1923–4 necessitated the ploughing up of 9·5 per cent. of the total area under cultivation with rye.

A germination test, in which two lots of 100 seeds are covered with a layer of brick-dust and kept for 14 days in a damp cellar, has been found a valuable method of gauging infection by *C. graminicola*. Diseased seed-grain germinates only to the extent of 30

to 50 per cent., while the figures for healthy material range from 90 to 95 per cent. or above. The use of diseased seed is stated to be responsible for a much higher proportion of infected crops than contamination through the soil, although the latter is not a negligible factor.

Persistent rain and absence of wind are pre-requisite conditions for the development of *C. graminicola*, the mycelium of which destroys the ovaries, and prevents the normal development of the grain. The loss from this type of injury alone may amount to 10 to 15 per cent. The sooner infection occurs after the opening of the blossoms, the more severe is the resultant damage to the young, soft grain. In many parts of Germany the rainfall from May to July in 1923 and 1926 was twice or three times as high as the average from 1899 to 1925: the critical flowering period was consequently prolonged from four or five days to three weeks, resulting in heavy infection of the grain.

The most severe losses from the disease occur in the coastal and mountainous districts, where rainfall and atmospheric humidity are greater than inland. Thus the heaviest damage in 1923-4 was sustained in East Prussia, Pomerania, Mecklenburg, Schleswig-Holstein, Hanover, and Bavaria. The disease is less prevalent on light sandy soils than on heavy ones.

Germisan, uspulun, agfa, tillantin, roggenfusariol, and other preparations may be recommended for the control of *C. graminicola*. Experiments with the two first-named indicate that the prescribed concentration may be reduced from 0·25 to 0·125 per cent., with an immersion period of five minutes. The cost of steeping with germisan at the lower concentration is estimated at Pf. 16 to 17 per cwt., exclusive of wages. The necessity of treating even high-grade seed-grain is strongly urged. Shallow sowing is stated to be the most important cultural measure for the prevention of the disease.

MOLZ (E.) & MÜLLER (K. R.). **Ueber das schlechte Auflaufen der Wintersaaten, insbesondere des Roggens.** [On the poor germination of winter-sown seed, especially Rye.]—*Deutsche Landw. Presse*, liv, 7, pp. 87–88; 9, pp. 117–118, 2 figs., 1 graph, 1927.

Reference is made to the serious damage caused to the German rye crop in 1926 by snow mould (*Fusarium*) [*Calonectria graminicola*: *R.A.M.*, vi, p. 223]. The writers conducted a series of experiments in the control of this disease by various dusts. Heavily infected seed-grain was sown at the rate of 30 kg. per 0·25 hect. on 13th October after treatment with abavit B, tutan, and uspulun dust (100 gm. per cwt.), respectively. The number of plants per 10 sq. m. averaged 268 on the control plots and 2483, 1597, and 2177 on the treated plots, respectively. On 2nd November a similar test was made with höchst dust, abavit B, and tutan. The average number of plants per 10 sq. m. was as follows: control, 138; abavit B, 726·5; tutan, 334·5; and höchst, 421·5. It is apparent from these figures that seed-grain treatment, even in the case of abnormally heavy infection and exceptionally late sowing is very effectual, especially with abavit B.

In another experiment Petkus original winter rye was sown on

4th and 5th October in six plots after the following treatment: immersion for 30 minutes in 0·125 per cent. germisan; sprinkling with 0·25 per cent. germisan; and dusting with abavit B, tutan, and uspulun at the rate of 150 or 100 gm. per cwt. The average number of plants in the different plots was as follows: control, 1659; germisan (immersion), 2095; germisan (sprinkling), 1943; abavit B (150 gm.), 2015; abavit B (100 gm.), 2029; tutan (150 gm.), 2041; tutan (100 gm.), 2025; uspulun (150 gm.), 2103; and uspulun (100 gm.), 1983.

A field test was carried out to ascertain the minimum amount of dust that could be used without impairing its efficacy. Abavit B was tested on duplicate plots of heavily infected seed at the rate of 75, 100, and 150 gm. per cwt., and the average number of plants per 10 sq. m. was as follows: control, 742; abavit B, 75 gm., 2548; 100 gm., 2864; and 150 gm., 2846. The results of these experiments indicate that, with carefully selected seed, 75 gm. per cwt. of abavit B should suffice for disinfection, while 100 gm. may be applied in ordinary samples. Uspulun dust should be used at the rate of 150 gm. Tutan and höchst are inferior to abavit B and uspulun for the purpose of snow mould control.

The urgency of seed-grain disinfection is briefly emphasized and the advantages of dusting outlined.

CHARDON (C. E.). **Observaciones sobre las enfermedades del Café en Colombia.** [Observations on the diseases of Coffee in Colombia.]—*Rev. Agric. Puerto Rico*, x, 1, pp. 5–9, 29, 1 pl., 1 fig., 1927.

The present report is the outcome of observations made by the author during a journey to Colombia with a view to studying the state of agriculture in that country. Special attention was paid by him to coffee, as it is stated to be the principal export crop in the province of Antioquia. Of the various diseases attacking the crop there, one of the most dreaded is the leaf spot caused by *Stilbum flavidum* (*Omphalia flavida*) [*R.A.M.*, v, p. 160], but the author was unable to find any trace of it owing to the hot weather prevalent from March to May in the year of his visit. Another dangerous disease, especially in old and neglected plantations, is a black root rot locally known as 'llaga' which, according to field observations, starts on the underground parts of the roots following wounding; isolations from the diseased tissues yielded an organism very similar in its morphological characters to the *Dematophora* [conidial stage of *Rosellinia* (?) *bunodes*] described from Guatemala by Fawcett (*Porto Rico Exper. Stat. Bull. 17*, 1915). Some damage is also done by sooty mould caused by an undetermined species of *Capnodium*.

MORRIS (L. E.). **Mildew in Cotton goods. Antiseptics and the growth of mould fungi on sizing and finishing materials.**—*Journ Text. Inst.*, xviii, 3, pp. T99–T127, 1 pl., 17 graphs, 1927.

The results are recorded in this paper of further studies which the author has made on the prevention of mould growth in manufactured cotton goods by the use of antiseptics [*R.A.M.*, v, pp. 362,

363]. Substances already used as such were tested to estimate their relative value; and fresh substances possessing more favourable properties were investigated for greater toxicity. The effect of the various antiseptics was tested in artificial cultures on an agar medium containing 2 per cent. of wheat flour or farina. The fungi concerned were two species of *Penicillium*, *Aspergillus* sp., *A. niger*, *A. flavus*, *Rhizopus arrhizus*, *Cladosporium herbarum*, and *Fusarium* sp., all isolated from mildewed cotton goods. Following inoculation of the medium by the fungus spores, records were made at intervals of the rate of growth as indicated by the measurement of two diameters at right angles, and of the amount of spore production. The relative efficiencies of the antiseptics in controlling the growth of all fungi tested were finally determined by comparison with phenol as standard. This was termed the phenol coefficient.

Of all substances tried, thallium carbonate gave the most successful results. The concentration toxic to all the fungi was 0·02 per cent., its phenol coefficient was 6·5, and it possessed no harmful properties. Formaldehyde, 2:4-dibromophenol, tribromophenol, p-nitrophenol, dinitrophenol, dichloro-o-cresol, and tetrabromocresol (phenol coefficients 2·6, 13·0, 13·0, 7·6, 6·5, 2·6, and 4·3, respectively) all compared very favourably with phenol, but possessed unsuitable properties such as volatility, tendencies to cause skin irritation, smell, or colour. Thymol (phenol coefficient 2·6), though a good antiseptic, was unfavourable on account of its expense. The other chemicals tested were about equal to, or less than, the efficiency of phenol.

The importance of taking a number of species into consideration in determining the efficiency of an antiseptic was shown by the fact that one species of *Penicillium* barely grew when 0·1 per cent. of boric acid was added and *A. flavus* could not resist 0·7 per cent., while 1·0 per cent. had no effect on another species of *Penicillium*. Thus to control all these species the quantity of boric acid required was largely in excess of that which would prevent damage from the first-named fungus.

A size made from flour required more antiseptic than one made from starch [loc. cit.].

The action of some antiseptics varied with the acidity of the medium, p-nitrophenol was more, and thallium carbonate less, effective in fermented than in fresh flour.

A brief review is given of the literature dealing with the relationship which appears to exist between chemical constitution and antiseptic efficiency.

LAYCOCK (T.). **Fungoid diseases of Cotton in Southern Nigeria.** —*Fifth Ann. Bull. Agric. Dept. Nigeria*, pp. 17–23, 1926.

This article presents a summary of the published information [*R.A.M.*, v, pp. 423–425; vi, p. 228] on the distribution and severity of diseases of cotton in Southern Nigeria. The diseases especially noticed are internal boll disease, in which *Nematospora gossypii* is the fungus most frequently present, anthracnose (*Glomerella gossypii*), *Fusarium* rot, bacterial disease (*Bacterium malvacearum*), and *Alternaria* disease. The importance of insect control in the

prevention of boll rots is stressed. The bacterial disease formerly considered important is said to have caused no appreciable injury on native farms during the years 1923–5.

SNOWDEN (J. D.). **Report on the occurrence of angular leaf-spot of Cotton (Bacterium malvacearum E. F. S.) in Uganda.**—*Uganda Dept. of Agric. Circ.* 17, pp. 3–12, 1 chart, 1926.

The author claims to have isolated in 1926, from young cotton seedlings raised from seed from a local ginnery and showing typical angular leaf spot lesions, a pale yellow bacterium, which entirely agreed in its cultural characters with *Bacterium malvacearum*. The pathogenicity of the organism to cotton was established by the inoculation of cotton bolls by pricking, which resulted in the production of spots surrounded by a water-soaked area, and of cotton seedlings by spraying, which gave from 61 to 86 per cent. positive results with typical stomatal infection; the organism was subsequently re-isolated. All the author's observations tended to confirm the view that the disease is carried on the seed; once it is introduced into a cotton plot, it is readily spread by rain, as was clearly demonstrated in the experimental plots. There was no evidence that it is transmitted by insects to any great distance, but it seems probable that it is introduced into the bolls by their agency when the bracts are already infected. Following the discovery of the disease, a careful survey was made in Uganda which showed that it occurs without doubt throughout the country, though careful search had previously failed to reveal any trace of the disease.

Besides the usual method of seed disinfection with sulphuric acid [*R.A.M.*, vi, p. 225], drying the seed with artificial heat or by exposing it to sunshine for suitable periods is also suggested, as preliminary experiments showed that the organism is killed when kept for two hours at a temperature of 52° to 55° C., or by a short exposure to bright sunlight. Some individual plants in the experimental plots also showed considerable resistance to the disease, and this would suggest the possibility of breeding resistant varieties.

MOURASHKINSKY (K. E.). О болезнях Сафлора. [Diseases of the Safflower.]—Reprinted from *Изв. Зап.-Сибирск. Отд. Русск. Географ. Об-ва.* [*Bull. West Siberian Sect. Russian Geogr. Soc.*], v, 6 pp., 1926. [Received March, 1927.]

The present paper records the diseases which were found to attack the safflower (*Carthamus tinctorius*) on the experimental field of the Siberian Academy of Agriculture in Omsk, where preliminary trials are being made with a view to introducing this crop into Western Siberia. The possibility of this introduction, in the author's opinion, is, however, rendered extremely doubtful owing to the prevalence of wilt disease (*Sclerotinia sclerotiorum*) [*R.A.M.*, iii, p. 650], which attacked almost every plant grown. The severity of the disease is considered to be probably due to the fact that the safflower is new to the region, and evidently especially susceptible to the strain of the parasite present in almost all the soils of Western Siberia.

Another disease which is extremely prevalent is a white leaf

spot, caused by a hitherto undescribed species of *Septoria*, which is named *S. carthami*. The spots are at first isolated and brownish, gradually changing to white on ageing, with a wide walnut-brown margin, and coalescing until the whole of the leaf blade is invaded; pycnidia amphigenous, occasionally epiphyllous, globose, dark brown, 82 to 186 μ in diameter; and stylospores hyaline, cylindro-clavate, with 4 to 6 septa (rarely 3 or 7 septa), smooth, 67 to 93 by 3·7 μ in diameter.

Other diseases are of minor importance. Black leaf spot is caused by a new species of *Cercosporella* which is named *C. carthami*; it causes rounded spots, at first pale brown, later black, up to 2 cm. in diameter, and bearing tufts of amphigenous conidiophores, somewhat resembling pycnidia in shape, olive-brown, 50 to 75 μ in diameter. The conidiophores are slightly articulate, hyaline, unbranched, septate, 30 to 45 (occasionally up to 74·4) by 4 μ in diameter, and the conidia cylindrical, rounded at both ends, hyaline, unicellular or sometimes 1-septate, rarely 2- and 3-septate, 52·1 to 66 by 5·6 to 6·5 μ in diameter. A species of rust produces on the leaves rounded, brown spots up to 1 cm. in diameter, bearing in their centre, chiefly on the under side, strongly convex, usually submerged, brown teleutosori up to 0·6 cm. broad. The fungus does not agree with the diagnosis of *Puccinia carthami* [*R.A.M.*, iii, p. 324], but is very similar to *P. centaureae* Mart., which is very prevalent on *Centaurea scabiosa* in the neighbourhood of Omsk, and with which the author identifies it provisionally. Among the varieties of safflower tested those with glabrous leaves appeared to be most susceptible to the rust, while the varieties with leaves covered with spines were comparatively resistant. Mildew caused by an undetermined species of *Oidium* also occurs, and the inflorescences were further attacked by species of *Helminthosporium* and *Fusarium*, which caused a rot of the newly formed seed. Latin diagnoses are given in the case of the two new species described.

THEODORESCO (S.). **Première épidemie de microsporie en Roumanie.** [First epidemic of microsporosis in Rumania.]—*Comptes rendus Soc. de Biol.*, xcv, 24, pp. 407–408, 1926.

Of 300 boys, 9 to 15 years old, examined at Bucharest in December, 1925, 70 showed erythemato-squamous lesions on the scalp, face, and upper part of the chest. Microscopic examination and cultural experiments showed that the condition was due to *Microsporon audouini* [*R.A.M.*, v, p. 553], which had not previously been recorded in Rumania and is believed to have originated in the newly acquired provinces.

VAN DER LINDEN (A.). **Sur l'action pathogène du Monilia albicans.** [On the pathogenic action of *Monilia albicans*.]—*Comptes rendus Soc. de Biol.*, xcv, 28, pp. 881–883, 1926.

The results of inoculation experiments on rabbits and guinea-pigs with three strains of *Monilia* [*Candida*] *albicans* [*R.A.M.*, vi, p. 96] and one of *Mycoderma lactis* are reported. The former proved considerably more pathogenic than the latter. Intraperitoneal inoculation was more uniformly successful than intravenal.

Immunization was not effected either with living or dead cultures of *C. albicans*.

MAGALHAES (O. DE). **Le genre Aleurophora (O. Magalhaes, 1916).** [The genus *Aleurophora* (O. Magalhaes, 1916).]—*Comptes rendus Soc. de Biol.*, xcv, 29, pp. 1000–1003, 1 fig., 1926.

The writer maintains the validity of his genus *Aleurophora* (*Brasil Medico*, 47, 18th November, 1916), which Vuillemin regards as synonymous with *Aleurisma*. A complete French diagnosis of *Aleurophora* is given and Link's Latin diagnosis of *Aleurisma* is cited for comparison. *Aleurophora benigna*, which occurs principally in the *stratum disjunctum* of the human epidermis, produces a sparse, dark chestnut-brown mycelium on certain media. Terminal and intercalary aleuria, blastospores, and arthrospores are produced, but no differentiated sporophores.

ROUBAUD (E.). **Sur un champignon entomophyte parasite des fourmis en Afrique Equatoriale.** [On an entomogenous fungus parasitic on ants in Equatorial Africa.]—*Bull. Soc. Path. Exot.*, xix, 9, pp. 815–819, 1 fig., 1926.

From a correspondent in Equatorial Africa the writer has received specimens of large dead ants (*Paltothyreus tarsatus* Fabr.), from the prothorax of which protruded slender, black filaments, 1 to 2 cm. in length. Close to the insects, on the branches to which they were clinging at the time of death, were large, black filaments, measuring 1 to 2 mm. in diameter and 40 to 60 (occasionally 80) cm. in length, of a flexible, rubbery consistency, and resembling in their size and glossy texture the bristles of an elephant's tail. The connexion between these filaments and those protruding from the prothorax was not immediately apparent, but on closer examination young, slender filaments of the latter type were found to be developing from the large black ones.

The nature of this curious phenomenon (to which the name 'liane pattes de fourmis' is applied locally in Ubangui) is briefly discussed. The large, black filaments were found, on microscopic examination, to be constituted by an immense number of pluriseptate hyphae, with a black, hard-walled cortical zone. This gigantic stroma far exceeds any of the dimensions habitually recorded for the entomogenous species of *Cordyceps* or *Isaria*. The slender filaments emerging from the prothorax have been, on the other hand, definitely identified as a species of *Cordyceps*. Asci containing eight filiform ascospores were observed on the dried material. The fertile stroma is attached by an enlarged base to the sides of the prothorax, and is connected with an internal sclerotium, the development of which probably caused the death of the insects. Similar cases have been reported by Wheeler and Bequaert (*Bull. Amer. Mus. Nat. Hist.*, xlv, 1921–2), the latter identifying the fungus of the prothorax with *C. myrmecophila*, discovered by Cesati in 1846 in Lombardy. This is believed to be the first report, however, of the development of the giant lianoid stroma, which the writer regards as the imperfectly developed conidial stage of the *Cordyceps* originating within the bodies of the ants. Possibly the lianoid stroma represents a more or less saprophytic species of *Isaria* [or of *Marasmius*: cf. *M. equicrinis*].

VUILLEMIN (P.). **Sartorya, nouveau genre de Plectascinées angiocarpes.** [*Sartorya*, a new genus of the angiocarpous Plectascineae.]—*Comptes rendus Acad. des Sciences*, clxxxiv, 3, pp. 136–137, 1927.

The perithecial stage of *Aspergillus fumigatus* has previously been referred to the genus *Eurotium* and the results of recent investigations made by Sartory, Sartory, and Meyer (*Comptes rendus Acad. des Sciences*, clxxxiii, p. 1360, 1926) appeared to confirm this hypothesis. According to the author, however, this fungus differs from all species of *Eurotium* in its elliptical, non-lenticular ascospores (similar to those of *Thielavia basicola* and *Allescheria gayoni*) and thick-walled perithecia embedded in a sclerotium, and he regards these differences as sufficient to justify its determination as a distinct and well-defined genus of the *Plectascineae* which is named *Sartorya* [without diagnosis], the species being called *S. fumigata* (Fres.) Vuill.

NELSON (C. I.) & DWORAK (MAYME). **Studies on the nature of wilt resistance in Flax.**—*North Dakota Agric. Exper. Stat. Bull.* 202, 30 pp., 1 fig., 24 graphs, 1926. [Received March, 1927.]

As a result of serological experiments [which are fully described] on the nature of wilt [*Fusarium lini*] resistance in North Dakota flax the writers have isolated from the seed of two varieties, one chosen for resistance (N.D.R. 155) and the other for susceptibility (N.D.R. 1215), globulins which appear to be associated in some way with the resistance factor [*R.A.M.*, v, p. 721]. The method used for the extraction of globulins from flax seed is described and their specific reactions in rabbits are reported. The globulins from each variety are separable by electrodialysis into two fractions, the first to precipitate being quite dark and the second, precipitating more slowly, light in colour. The globulin nature of these fractions was demonstrable both in regard to solubility and colour reaction criteria, and it was further possible in one case to crystallize the purified product.

Precipitin tests made with the sera produced against the various fractions, both singly and in groups, indicate their high specificity. It is not clear whether the brown or white fraction of globulin carries the greater amount of specificity for the plant variety. An arbitrary mixture of the two was found to be less specific than the unseparated globulin.

It would appear from the results of these experiments that the globulins extracted from seeds of more or less definitely wilt-resistant or susceptible varieties fall generally into two serological groups: (1) a general group obtained from wilt-resistant varieties, and (2) a loosely composed group obtained from susceptible varieties. There are indications that the resistance to flax is a phylogenetic character which may be manifested serologically, and that the lack of this serological peculiarity, rather than the possession of other common characteristics, marks most other flax varieties. Thus, N.D. 1215, N.D. 345, and N.D. 704, all susceptible to wilt, show no special serological unity.

These experiments do not show that varietal resistance to flax

wilt is due to the possession of certain globulins, but merely that the two characters are associated in a suggestive manner. It is uncertain whether resistance is a result of the globulin structure, but it seems more probable that some other factor associated with the globulin vehicle will be found to be concerned.

HENRY (A. W.). **Flax rust and its control.**—*Minnesota Agric. Exper. Stat. Techn. Bull.* 36, 20 pp., 2 pl., 1926.

The present bulletin gives a brief account of flax rust, *Melampsora lini* [*R.A.M.*, v, pp. 490, 721], and of its distribution throughout the world. In North America, where most of the crop is seed flax [linseed], the chief damage consists in a reduction (sometimes by as much as 10 per cent.) in the yield of seed, whereas in the few centres where fibre flax is cultivated no destructive epidemics of the fungus have so far been reported. Notes are also given on the epidemiology of the rust in Minnesota and the neighbouring States, from which it appears that under local conditions the uredo stage may persist until the onset of killing frosts, while the teleuto stage readily overwinters and starts the initial infections in the following year.

Extensive experiments were made during several years consecutively in the attempt to breed varieties of flax for combined resistance to rust and to wilt (*Fusarium lini*) by crosses between immune and susceptible varieties, most of the results of which have already been noticed from other sources [loc. cit. and ibid., iv, p. 416]. The fact that four rust-resistant strains of flax from Holland all developed rust when tested in the greenhouse at St. Paul, Minnesota, indicates, in the author's opinion, the existence of different biological forms of the fungus.

Until immune varieties of flax are introduced, the spread of the disease may be prevented by the use of home-grown seed to obviate the danger of introducing the disease from infected localities. The seed should be thoroughly cleaned before use, the sowing should be done early, avoiding low-lying soils, and all infected stubble should be removed from the fields before the new crop emerges. The flax should be grown in rotation with some other crop, preferably maize or one of the leguminous crops.

HENRY (A. W.). **Flax rust, a preventable disease.**—*Minnesota Agric. Exten. Div. Spec. Bull.* 109, 8 pp., 3 figs., 1926.

This is a popular and abridged version of the author's earlier paper on flax rust [*Melampsora lini*; see preceding abstract].

BATES (P. K.) & PRESCOTT (S. C.). **Preliminary studies on the microbiology of Manila Hemp.**—*Journ. of Bact.*, xiii, 1, p. 67, 1927.

In this paper, presented at the 28th annual meeting of the Society of American Biologists, held at Philadelphia on 28th to 30th December, 1926, the results of a preliminary investigation on the microbiology of Manila hemp [*Musa textilis*] are briefly recorded [see also *R.A.M.*, vi, p. 295].

Several types of large bacilli, together with a few moulds (*Aspergillus*), were found on the fibres. The bacilli are unusually large,

quick growing spore formers, developing profusely on potato and starch agars, causing a marked peptonization of milk and liquefaction of gelatine in some cases, and reducing nitrates to nitrites. The poorer grades of fibres were heavily infected. A decrease in the number of the organisms and in the number of types occurs when the fibres are held in ordinary storage. During the six weeks' incubation tests some evidence was obtained that the organisms digest or weaken the cementing substances that bind the fibres together. The moulds develop comparatively rapidly on the fibres in a moist atmosphere and may attack both the gum and fibre substance.

TEODORO (N. G.) & SERRANO (F. B.). **Abacá heart-rot and bunchy-top diseases and their control.**—*Philipp. Agric. Rev.*, xix, 3, pp. 243–247, 20 pl., 1926. [Received 1927.]

This is a brief, popular account of the two diseases of abacá [*Musa textilis*] which are stated to be devastating comparatively large areas in Cavite, Laguna, and Batangas provinces of the Philippine Islands, namely: heart rot [*R.A.M.*, iii, p. 38] caused by a fungus described as being very similar to, if not identical with, the causal organism of the banana wilt disease [*Fusarium cubense*]: and bunchy top [ibid., vi, pp. 43, 174] which the authors believe to be caused, in part at least, by a nematode (*Heterodera radicicola*).

PAPE (H.). **Eine Vermehrungs-Krankheit bei Begonien Blattstecklingen.** [A propagation disease in Begonia leaf cuttings.] —*Gartenwelt*, xxxi, 3, pp. 35–36, 1 fig., 1927.

In December, 1926, the writer observed a number of failures among leaf cuttings of Gloire de Lorraine begonias, which were affected by a decay of the petioles, eventually spreading over the entire leaf surface. Microscopic examination revealed the presence in the affected tissues of the mycelium of *Botrytis cinerea*, and inoculation experiments with this fungus on Gloire de Lorraine begonia leaves resulted in 60 per cent. infection. *Pythium de Baryanum*, *Phytophthora omnivora*, *Moniliopsis aderholdi*, and other widespread facultative parasites are probably also implicated in the causation of this disease, which may be controlled by thorough disinfection of the soil, attention to aeration and ventilation, scouring the frames with 1 to 2 per cent. copper sulphate, and strict cleanliness of utensils.

FLACHS. **Schrotschusskrankheit an Kirschlorbeer.** [Shot hole disease of Cherry-Laurel.]—*Blumen- und Pflanzenbau*, xlii, 5, p. 65, 1 fig., 1927.

The cherry-laurel (*Prunus lauro-cerasus*) is stated to suffer occasionally from the attacks of an organism closely related to the shot hole fungus (*Clasterosporium carpophilum*) [*Coryneum beijerinckii*]. The causal organism of the cherry-laurel disease (*C. lauro-cerasi*) produces on the leaves reddish-yellow to brown, more or less circular spots, with well-marked edges. Subsequently the affected tissues fall out, leaving holes of 5 to 25 mm. in diameter. From the spots emerge groups of conidiophores, bear-

ing dark, elliptical conidia measuring 60 to 80 by 15 to 17 μ, with 5 to 7 (usually 6) septa.

Control measures should include the removal of infected material and repeated applications of a 1 to 2 per cent. Burgundy mixture.

FLACHS. **Brandfleckenkrankheit an Dahlien.** [Smut disease of Dahlias.]—*Blumen- und Pflanzenbau*, xlii, 5, pp. 64–65, 2 figs., 1927.

A brief account is given of a disease of dahlias which is stated to have caused considerable damage in Germany during the last two years [*R.A.M.*, vi, p. 97]. The author states that the circular to elongated, brown, sometimes zonate spots, measuring 3 to 8 mm. in diameter, eventually assume a leaden grey colour. The mesophyll of the affected leaves contains innumerable polygonal, thick-walled, hyaline or light brown spores, measuring 12·5 by 16 μ in diameter and belonging to the genus *Entyloma* [Tubeuf's account of which is briefly recapitulated]. The causal organism of the dahlia disease is believed to be identical with *E. calendulae*.

SCHENK (P. J.). **Vaste planten en ziekten.** [Perennial plants and diseases.]—*Floralia*, xlviii, 8, pp. 126–127, 2 figs., 1927.

Perennial plants are stated to be generally pretty free from disease in Holland, but the writer has observed the following cases of parasitism. *Helianthus* is attacked by a fungus causing a bending of the stalks. The leaves of Christmas roses [*Helleborus niger*] sometimes show dark spots produced by a species of *Coniothyrium*. Peonies [*Paeonia officinalis*] and lilies of the valley (*Convallaria*) [*majalis*] are liable to infection by *Botrytis paeoniae* and *B. cinerea* [*R.A.M.*, iv, p. 44]. The importance of prophylactic treatment with Bordeaux mixture or sulphur is briefly indicated.

SOLBERG (LOUISE). **Syke Stedmorsblomster.** [Diseased Pansies.] —Reprinted from *Havedyrkningens Venners Medlemsskr.*, 2, 3 pp., 1 fig., 1926. [Received April, 1927. English summary.]

Cultivated pansies [*Viola tricolor*] in Norway are liable to a root rot which is probably due to one or more Phycomycetes. Microscopic examination of diseased roots has revealed the oospores of three distinct fungi, one of the *Pythium de Baryanum* type, one with large, spiny oospores *P. hydnosporum* [*P. artotrogus*], and one with small oospores not exceeding 10 μ in diameter. Macroscopic symptoms include a bronze discoloration of the leaves, a general stunting of the foliage and flowers, and ultimate death of the plants from decay of the whole root system, including the rootlets produced from the axils of the lower leaves. The disease may be controlled by the disinfection of the seed-beds with formalin at the rate of 0·5 l. per sq. m.

Sprøjtevaedsker til Bekaempelse af Plantesygdomme og Skadedyr. [Sprays for the control of plant diseases and pests.]—*Statens Forsøgsvirksomhed i Plantekultur Meddel.* 120. [Reprinted in *Tidsskr. for Planteavl*, xxxii, 5, pp. 701–705, 1926.]

Notes are given on the application of the principal fungicides used in Denmark, chiefly for the control of the diseases of fruit

trees, a full account of which has been given in a previous paper [*R.A.M.*, v, p. 559].

Sprøjtning af Frugttræer. [Spraying of fruit trees.]—*Statens Forsøgsvirksomhed i Plantekultur Meddel.* 122. [Reprinted in *Tidsskr. for Planteavl*, xxxii, 5, pp. 708–712, 2 figs., 1926.]

Directions are given for the winter and summer spraying of apples and pears in Denmark [see preceding abstract], the schedules for both periods being presented in tabular form.

FISHER (D. F.). **New Apple rot unmasked and named.**—*Better Fruit*, xxi, 5, pp. 9–10; 6, p. 11, 1926.

A rot of apples, chiefly attacking the Winesap variety, has been recorded frequently from central Washington during the last five years, but owing to its failure to produce spores the causal organism was not identified till 1925. In that year two lots of Winesap were inspected before shipping and were found to be badly affected with this rot, the loss from it amounting to from 15 to 40 per cent. It was found on inquiry that the fruit had been harvested very late and after heavy rains occurring in mid-October. Both the orchards of origin were visited and, though no signs of the disease were found on the Winesap trees, many cankers due to *Gloeosporium perennans* Zeller & Childs [*R.A.M.*, v, p. 103] were discovered on interplanted trees of the Spitzenberg variety. Inoculation tests with spores from these cankers on sound apples produced typical symptoms of the rot, which is therefore considered to be due to the same organism. The rot progresses slowly, developing best and producing most spores at 50° to 60° F. In its earlier stages it closely resembles the rot due to north-western anthracnose [*Neofabraea malicorticis*], showing two or more concentric zones round a light brown area with a tan centre, but it differs in the somewhat lighter colour, in the presence of a dark ring at the margin of the healthy tissue, and in the fact that infection always takes place through the lenticels. On stored apples the rot is rarely noticeable till February or later, and under very humid conditions the apples become covered with a heavy white mycelium, a condition which never occurs with true anthracnose.

Although no definite control measures can be given, the following facts are noted. Infection is most likely to occur in apples exposed to heavy rains, packed when wet, or stored at high humidities, and such conditions should be avoided. Cankered branches should be removed and cankered areas cut out and disinfected with Bordeaux paste or coal tar and creosote. The author recommends that vigorous action should be taken to eliminate all seriously affected trees and ultimately to replace Spitzenberg by other less susceptible varieties.

CURZI (M.). **Una moria di giovani piante di Pero e un nuovo genere di Pyrenomycetae.** [A disease of young Pear trees and a new genus of Pyrenomycetes.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. III, iii, pp. 73–89, 1 pl., 9 figs., 1926.

In this paper the author gives a detailed account of the new form of root rot of young grafted pear trees noticed by him in 1924

[*R.A.M.*, iv, p. 678]. The disease appears to be limited to the roots and extreme base of the trunk and to originate at the graft, progressing downwards into the main roots and sometimes into the secondary ones.

By placing diseased portions, previously washed in corrosive sublimate, in Petri dishes, the author obtained a perithecial fungus which also occurs on the cortex of diseased roots. This fungus is referred to the new genus *Montemartinia* [loc. cit.], which is closely allied to *Melanopsamma* but distinguished from it by the absence of paraphyses, and the species itself is styled *M. myriadea*, full Latin diagnoses of genus and species being given. The perithecia are small, ovate, and smooth, from 150 to 200 μ in diameter, at first olive-coloured, later black, and with a prominent ostiole when mature; the asci are 8-spored and 35 to 45 by 3·5 to 4 μ; the ascospores are monostichous, ellipsoid, hyaline, uniseptate, and 3·5 to 4·5 by 2 to 2·5 μ.

Isolations from the interior of infected roots yielded a white, later brownish, mycelium resembling that found in the wood, which produced pycnidia of a species of *Coniothyrium*. Similar pycnidia occur on the cortex and have repeatedly been obtained in cultures from the ascospores. The pycnospores are olive-coloured, oval or ellipsoid, 3 to 4 by 2·5 μ. They germinate readily, swelling to two or three times their diameter in the process.

A conidial form identified as a species of *Ramularia*, closely resembling *R. macrospora*, was observed on media containing starches and sugars but not on the host. The spores are cylindrical or slightly truncate, conical, with 1 to 3 septa, and 20 to 50 by 3·5 to 6·5 μ. They germinate with 1 or 2 germ-tubes and give rise to pycnidia, a characteristic distinguishing the species from *R. macrospora*.

Chlamydospores were formed in old cultures from ascospores, pycnospores, and conidia, and also occur on the cortex. They are hyaline at first, becoming light brown, with granular contents, and smooth walls. They are pear-shaped, ellipsoid, or globular when intercalary and obpyriform when terminal. No germination was observed.

All forms described above are regarded as belonging to the same fungus. Artificial inoculations on ungrafted plants of wild pear gave negative results and are to be repeated. On half-ripe fruits of pear and apple, however, inoculations resulted in the production of a rot and the author considers that the fungus is probably weakly parasitic.

RIOLS (P.). **Expérimentation de quelques bouillies préconisées contre Sphaerotheca mors-uvae.** [Tests of certain mixtures recommended for the control of *Sphaerotheca mors-uvae*.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 323–327, 1926.

In this paper the author records the results of spraying experiments against gooseberry mildew (*Sphaerotheca mors-uvae*) carried out at the Larrey Research Station.

The applications were given in the evening on 10th and 26th April and 10th and 26th May, respectively. Bordeaux mixture (1 kg. copper sulphate, 2 kg. lime, 100 kg. water), with or without

the addition of casein, gave unsatisfactory results, the plots sprayed showing almost as severe an attack as the controls. Potassium permanganate (0·15 per cent.) and formalin (0·2 per cent.) also did not prevent the fruit becoming severely attacked. Liver of sulphur (0·4 and 0·8 per cent.) gave 36·0 and 60·4 per cent. healthy respectively, but caused serious injury to the berries. Burgundy mixture (1·5 per cent. each of copper sulphate and dehydrated sodium carbonate) [*R.A.M.*, iii, p. 406] yielded 18·5 and 26·4 per cent. healthy in two plots. Whilst these results are not absolutely conclusive, nevertheless they are considered to show that the liver of sulphur is the most active of the fungicides tested.

SPAETH (C. P.) & KRAYBILL (H. R.). **A biochemical study of the false-blossom disease of the Cranberry.**—*Journ. Agric. Res.*, xxxiv, 1, pp. 35–47, 1927.

The study described in this paper was undertaken to discover, if possible, whether the false blossom disease of the cranberry [*Vaccinium macrocarpon*] is due, as has been previously imagined, to faulty nutrition, or whether any support could be given to the growing belief that this is an infectious disease [*R.A.M.*, v, p. 565; vi, p. 303].

Extensive samples of diseased and healthy leaves and stems were gathered from different bogs in 1920, 1922, and 1923, and chemical analyses made of these organs. The method of procedure is fully described. It was found that the amount of reducing sugars was from 20 to 60 per cent. higher in the leaves of diseased plants, and 6 to 37 per cent. higher in the diseased stems. Sucrose was present in the diseased stems in amounts varying from 28 to 147 per cent. greater than in healthy stems, but only in the 1923 samples was the percentage higher in the diseased leaves. In all samples except those collected in 1922, the diseased leaves and stems showed an increase in starch content. In the leaves this varied from 99 to 55 per cent. more than the quantity in healthy leaves. In all cases the diseased organs were higher in acid-hydrolysable substances than the healthy ones, the difference ranging from 3 to 37 per cent. Thus the total carbohydrate content of diseased leaves and stems, in all samples except those taken in 1922, was much greater than that of corresponding healthy organs.

As regards the total nitrogen and phosphorus contents, no constant significant differences between healthy and diseased tissue were found. Moisture was higher and the dry matter lower in the healthy organs. Soil samples taken from diseased and healthy bogs or parts of the same bog showed that diseased plants are found on soils with either high or low moisture contents. Excessive nitrogen was not present in the soil samples.

The analyses show that false blossom is not the outcome of excessive amounts of available nitrogen, or of improper cultural conditions. It is suggested by the writers from observations of the spread of the disease in Massachusetts and Oregon from nursery stock from Wisconsin [ibid., iv, p. 490], that the disease is infectious, and may probably be similar to such virus diseases as yellows and mosaic. This theory is strengthened by the analytical data

given above since these are comparable to those got from spinach plants affected with mosaic.

OCFEMIA (G. O.). **Macrophoma musae (Cke.) Berl. and Vogl. and Phoma musae Carpenter.**—*Philipp. Agric.*, xv, 8, pp. 467–469, 1 fig., 1927.

The freckle or black spot of the banana and plantain [*R.A.M.*, v, p. 749] caused by *Macrophoma musae* is stated to have been present in the Philippine Islands probably ever since the crop was cultivated there, and to occur on practically all of the commercially important varieties of *Musa sapientum*. Numerous minute, greyish or brown to dark brown, raised spots, with black pycnidia in the centre, are formed on the fruit and on the leaves. Under field conditions, the spread of the disease appears to be effected by rain, and the secondary lesions are produced only on the portions of the fruit and leaves which are washed by conidia-laden rain water. In the Philippines the disease does not seem to cause much damage, as the fungus very rarely penetrates deeper than the rind of the fruit. The author's measurements of the pycnidia and pycnospores of the causal organism closely agree with Carpenter's description of *Phoma musae* from Hawaii; he therefore considers both organisms to be identical and concurs in Reinking's view that the latter should be reduced to a synonym of *Macrophoma musae* [loc. cit.]. The pycnospores are stated to be enclosed in a gelatinous sheath, and each is provided with a hyaline, granular appendage which has probably been overlooked in the examination of dried material.

BOGAYONG (J. R.). **Root disease on Lanzones.**—*Philipp. Agric. Rev.*, xix, 3, pp. 259–261, 1926. [Received 1927.]

Cultivated lansa trees (*Lansium domesticum*) are stated to be heavily attacked in different localities of the Philippine Islands, especially in San Pablo, by a root rot apparently originating at the small lateral roots, and gradually extending into the larger roots and into the base of the stem below ground. Externally, the early stage of the disease is characterized by the yellowing and wilting of the leaves, and the gradual shedding, first of the younger and later of the older leaves. In the advanced stage, all the roots decay up to the base of the stem, when the tree dies. A wet, cottony, white mycelium, visible to the naked eye, penetrates the wood and rots the tissues of the affected roots, which are usually brownish black in parts. The trees growing on poor, badly cultivated soil appear to be much more susceptible to the rot than those on better tilled soil. The control measures recommended are the immediate destruction by fire of all dead stumps and diseased material; a sparse planting of the trees; the excision of the diseased portions; and the application of lime to the soil. Lansa trees should never be planted again in already infected soil, for the fungus may live in the soil for many years.

F. (E. J.). **Beimengungen im Karbolineum.** [Admixtures in carbolineum.]—*Teer*, xxv, 1, pp. 5–6, 1927.

Attention is drawn to the common practice of adding various substances to Avenarius carbolineum (extensively used in Germany

as a timber preservative) with a view to increasing its viscosity, specific gravity, non-volatility, and antiseptic properties. The writer enumerates the low-boiling oils extracted from anthracite, lignite, peat, bituminous shale, or wood, and also resin, resin-oil, mineral oils, and oil- and water-gas tar, as being deleterious to the quality of the preservative. Tars from hard woods (e.g., beech), though possessing marked fungicidal properties, are also unsuitable owing to their tendency to cause the formation of resinous bodies. Zinc chloride and non-volatile phenols and naphthols can apparently be added without injurious effects.

TEODORO (N. G.). **Philippine mycological and phytopathological literature index, I[a].**—*Philipp. Agric. Rev.*, xix, 3, pp. 275–291, 1926. [Received 1927.]

This is the first of a series of lists which the author proposes to issue from time to time of all the literature published prior to January, 1926, bearing on mycology and phytopathology in the Philippine Islands. The present list comprises 279 titles of monographs, scientific and popular short articles, and general agricultural papers arranged in chronological order; and 35 titles of periodical publications cited.

[COSTANTIN (J.)]. **La vie asymbiotique des Orchidées.** [The asymbiotic life of Orchids.]—*Ann. Sci. Nat., Bot.*, Sér. X, viii, 3–6, pp. i–xvi, 1 fig., 1926.

In the present paper the author discusses the views put forward by various investigators with regard to the suggested normal behaviour of asymbiotic orchid plants. In dealing with this problem he lays stress on the importance of ascertaining whether this asymbiosis is permanent before stating definitely that a plant behaves normally or otherwise, as the somewhat free use of the term 'normal plant' may refer only to the external appearance. According to Bultel the presence of the endophyte does not appear to be essential either to the life or to the flowering of orchids [*R.A.M.*, v, p. 758], but the fact that these experiments were discontinued before any definite conclusions were reached, leaves the matter still open to dispute. Even should it be proved that asymbiotic orchids may be made to flower, the author doubts the advisability of concluding from this that symbiosis does not exist between the orchid and its endophyte.

JONES (L. R.), JOHNSON (J.), & DICKSON (J. G.). **Wisconsin studies upon the relation of soil temperature to plant disease.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 71, 144 pp., 69 figs., 1926.

The purpose of this bulletin has been to bring together in summarized form a considerable body of published but scattered data [most of which has been noticed in this *Review*] dealing with the influence of variations in a single factor, temperature, upon plant diseases caused by soil-borne micro-organisms which invade the subterranean parts of the hosts. The pathogens have included gall-inducing organisms of such widely different kind as bacteria, slime-moulds (*Plasmodiophora brassicae*), and nematodes, along with

fungi producing various grades and modes of parasitic attack. The studies were carried out with the aid of the Wisconsin soil temperature tanks, the development of which is described in detail, supplemented by attention to soil moisture, air temperature and humidity, and other environmental factors, and checked by observations on disease development under natural conditions coupled with field temperature records over a succession of years. In the concluding section of the bulletin the bearing of the results obtained upon the geographical distribution of certain of the diseases, their seasonal incidence and severity, and the nature of host resistance and susceptibility are discussed [see also *R.A.M.*, ii, p. 136; iv, p. 304].

The diseases investigated may be grouped in three classes: first, those favoured by relatively high soil temperatures such as the three vascular *Fusarium* wilts, cabbage yellows (*F. conglutinans*), flax wilt (*F. lini*), and tomato wilt (*F. lycopersici*); secondly, those promoted by low temperatures, such as onion smut (*Urocystis cepulae*), tobacco root rot (*Thielavia basicola*), and potato stem canker (*Rhizoctonia* [*Corticium*] *solani*); and thirdly, the cereal seedling blight caused by *Gibberella saubinetii*, in which the disease is severe at high soil temperatures on some hosts, e.g., wheat, and severe at low temperatures on others, e.g., maize.

The disease curve of the high temperature *Fusarium* wilts parallels closely that of the vegetative development of the parasites (optimum 28° C.), indicating that the influence of temperature is mainly a direct effect on the fungus; this effect was especially clear in the case of tomato wilt [*R.A.M.*, ii, pp. 428, 477]. The same direct influence on the parasite was also very apparent in the low temperature onion smut (optimum 15° to 20°), which is completely inhibited above 28° [ibid., v, p. 464]; this disease extends across the northern States when the crop is spring sown, but is unknown in the Gulf States (although regularly introduced in setts), where planting is done in late summer and early autumn when the soil temperature normally exceeds 28°.

In the case of potato stem canker [ibid., iii, p. 361], although infection is most severe at low temperatures (optimum about 18°) the fungus growth curve has a relatively high temperature optimum; the effect may be due partly to the more rapid growth of the potato shoots at the higher temperatures, but the more aggressive attack of the parasite at the lower temperatures appears to be due either, as Balls has suggested, to autointoxication or more simply to excretion of products, probably enzymic, which facilitate penetration.

The seedling blight of cereals (*G. saubinetii*) has been investigated in particular detail by Dickson and his associates [ibid., iii, p. 390; v, pp. 247, 545]. At high temperatures, near its optimum for seedling development, maize is not infected with blight because the pectinized walls of the susceptible embryonic tissues are quickly replaced by cellulose and suberized walls, which resist penetration by the parasite; at low temperatures the changes in the walls and cell contents are delayed and penetration favoured, so that severe blighting occurs. In the case of wheat, low temperatures are essential for rapid changes in tissue from susceptibility to resistance, so that the relations of temperature to the parasite are the

reverse of those for maize. More recently Dickson and Holbert [ibid., v, p. 545] have examined the resistance of selfed lines of maize at various temperatures; resistant strains resisted invasion and blighting at temperatures as low as 12°, intermediate strains were susceptible below 20° to 24° and resistant above 24°, while very susceptible strains were susceptible at all temperatures at which the parasite would grow. Detailed studies of host metabolism, cell-wall composition, and fungus penetration over a wide range of temperatures with these strains indicated a strong similarity between 'inherited' resistance and resistance 'induced' by external factors—mainly temperature. The inference is drawn that 'disease resistance or predisposition as thus exemplified are relative, being influenced in their expression by temperature as well as by other variable factors of environment'. Consideration of all the data presented gives strong support to the fundamental conception in pathology that 'the associated abnormal host conditions which we term "disease" are the resultants of the interaction of a plastic host and a plastic parasite under the play of variable environment'.

A bibliography of 117 titles is appended.

SCOTT (I. T.). **Some protein analogies of the mycelium of Fusasarium lycopersici.**—*Missouri Agric. Exper. Stat. Bull.* 92, 44 pp., 9 graphs, 1926.

Living mycelial mats of *Fusarium lycopersici* were placed in buffered and unbuffered single salt solutions at different hydrogen ion concentrations and the reaction changes were measured by electrometric or colorimetric methods. A change in the reaction of the solution was found to occur, equilibrium being reached at or near P_H 5·4. The writer interprets this to mean that on the acid side of P_H 5·4 the tissue acts as a cation and combines with anions, thus changing the reaction of the solution towards greater alkalinity. On the alkaline side of P_H 5·4 the tissue acts as an anion, combining with cations, and causing a reaction change towards greater acidity. At P_H 5·4, the tissue acts as if it were electrically neutral and combines equally with cations and anions, or with neither, giving no change in reaction with the solution. These results confirm the view that *F. lycopersici* behaves in a manner analogous to an amphoteric colloid with an isoelectric point at or near P_H 5·4 [*R.A.M.*, iv, p. 720].

Dead mycelial mats treated in a similar way did not show a definite equilibrium point like the living tissue. There was, however, evidence to show that an isoelectric point for the dead tissue may exist at or near P_H 5·88.

Since *F. lycopersici* appears to act as an ampholyte, on the acid side, the mycelium would be expected to act as a base and combine with cations. On this basis, cations should be more toxic than anions on the alkaline side, whilst on the acid side, the reverse would be the case. Preliminary studies to determine the effect of hydrogen-ion concentration upon spore germination showed that there was a double maximum percentage germination near P_H 4·5 and 7, respectively, with a minimum between P_H 5·0 and 5·5. Further studies showed that the germination of spores was greatly

inhibited in solutions acid to P_H 5·4 when toxic anions like cyanide and the acid dye eosin were used in concentrations near their toxic limits, while the reverse was found with the toxic cations mercuric and cupric, and the basic dye methylene blue. Thus the behaviour anticipated on the assumption that the living tissue of the fungus *F. lycopersici* acts in a manner analogous to an amphoteric protein was fully borne out.

BOLLEY (H. L.) & COUEY (W. G.). **Potatoes, certification for seed in North Dakota.**—*North Dakota Agric. Exper. Stat. Circ.* 31, 12 pp., 3 figs., 1926.

All certified seed potatoes in North Dakota must meet the following requirements as to the tolerance of diseases. Common scab [*Actinomyces scabies*], 3 to 10 per cent. of tubers. Black scurf (*Rhizoctonia*) [*Corticium solani*], 3 to 10 per cent. of vines or tubers. Wilt or *Fusarium* rots [*F.* spp.], 3 to 5 per cent. of vines or tubers. Stem-end browning of unknown cause, 3 to 10 per cent. of tubers. Blackleg [*Bacillus atrosepticus*], 1 to 3 per cent. of vines or tubers. Mosaic, 3 to 5 per cent. of moderate but definite infection of vines. Secondary mosaic or indefinite mottling, 3 to 10 per cent. Spindle tuber, 2 to 5 per cent. of vines and tubers. Spindling sprout, 3 to 5 per cent. of vines or tubers. Any combination of the foregoing or other potato diseases, 3 to 10 per cent. of vines or tubers.

Late blight [*Phytophthora infestans*], powdery scab [*Spongospora subterranea*], and black wart [*Synchytrium endobioticum*] have not been observed in North Dakota.

MACMILLAN (H. G.). **A method of growing bacteriologically sterile Potato plants.**—*U.S. Dept. of Agric. Bull.* 1465, 21 pp., 6 pl. 5 figs., 1 graph, 1927.

The author describes the methods he adopted in growing bacteriologically sterile potato plants with the object of observing pure symptoms of diseases caused by *Fusarium* and other soil fungi. The plants were grown in large cans, which were first filled with soil, then sterilized, and immediately afterwards sealed with specially designed covers. Sterilized water was admitted to the cans through a tube fitted on the lid. Great difficulty was experienced in rendering the potato seed-pieces sterile without destroying their powers of growth, and only 5 per cent. of tubers sterilized gave satisfactory germination. The germinating seed-pieces were finally planted in the cans, and a glass lamp chimney, closed at the top with a cotton wool plug fitted into the lid, so that the young plant could grow up into the light. The growth of the plants was very feeble apparently on account of the toxicity of the sterilized soil, damage to the eyes of the seed-pieces, and an unfavourable temperature and environment. That the plants so produced were sterile was proved by incubating fragments of leaves and roots in an agar medium.

The immediate aim of producing sterile potato plants was thus achieved, but the ultimate object of inoculation with *Fusarium* could not be carried out with any useful results on such abnormal plants.

KNORR (P.). **Versuchsergebnisse auf dem Gesamtgebiete des Kartoffelbaues in den Jahren 1921/1922.** [Experimental results of investigations on the cultivation of Potato in the years 1921 and 1922.]—*Arb. Forschungsinst. für Kartoffelbau*, 8, 182 pp., 1927.

The part of the present report dealing with potato diseases and their control [pp. 142–154] is a compilation of the reports from various German agricultural boards and experimental stations on the results obtained by them in the years 1921 and 1922. Spraying tests against late blight [*Phytophthora infestans*] with bordola copper powder, bordola copper paste, 2 per cent. Bordeaux mixture, 2 per cent. milk of lime, kurtakol, and nosperal, gave inconclusive results, as blight was rare in both years owing to dry weather, but there were indications that spraying, as such, had an injurious effect on the yield and starch content of the tubers, especially marked in the case of some varieties. Wart disease [*Synchytrium endobioticum*] was practically absent from the chief potato growing regions of Germany in 1921, and no observations could therefore be made regarding the relative resistance of potato varieties to the disease in that year. In 1922, when conditions are stated to have been very favourable to the disease in some localities, experiments carried out under very severe conditions demonstrated the entire immunity of Thiele's Kuckuck, Früheste, and Magdeburger Blaue; v. Kameke's Beseler, Pepo, Hindenburg, and Nepeta; Paulsen's Goldperle, Isolde; and Cimbal's Geh. Werner, and Neuer Imperator. Preliminary experiments were made in Hanover to test the possibility of controlling wart disease by soil disinfection with 2·5 and 5 per cent. germisan bolus, cyanide-lime-sulphur powder, and calcium cyanamide; cyanide-lime-sulphur gave negative results, and 2·5 per cent. germisan bolus was only partly effective, while no warted tubers were obtained in the soil treated with 5 per cent. germisan bolus or calcium cyanamide; the latter had, however, a very retarding effect on the growth of the potatoes, so that at the harvest the plants were still entirely green and the tubers unripe. With the germisan bolus also growth was at first retarded, but later the plants developed strongly and outstripped the controls. A series of experiments started in 1910 by the Bonn Institut für Pflanzenkrankheiten indicated in 1921 that in the eleventh year of cultivation in the absence of the host the virulence of sporangia of *S. endobioticum* was so attenuated that they were no longer able to infect the potato plants. It is regretted that the report for 1922, a year very favourable for wart disease in the region, does not contain a confirmation of this important finding. During the two years under review observations were also made at Bonn on the relative resistance of different varieties of potatoes to early blight (*Alternaria solani*) and wet rot.

KÖHLER (E.). **Methodische Bemerkungen zum Infektionsverfahren nach Spieckermann (Prüfung von Kartoffelsorten nach Krebsverhalten).** [Observations on the methods used in Spieckermann's inoculation process (testing of Potato varieties for reaction to wart disease).]—*Fortschr. der Landw.*, ii, 4, pp. 115–118, 1 graph, 1927.

In connexion with a series of experiments on the reaction of

potato varieties to wart disease [*Synchytrium endobioticum*], as gauged by Spieckermann's method [*R.A.M.*, iii, p. 600], the writer found that the decay of the tuber sections embedded in compost may be prevented by 30 minutes' immersion in 0·25 per cent. uspulun, which does not reduce their infectivity. Sporangial development was just as rapid under dry as under moist conditions in these experiments. The number of freshly evacuated sporangia declines from month to month down to complete cessation of development [ibid., v, p. 577]. Attention is drawn to the occasional discovery of small excrescences, resembling those due to *Bacterium tumefaciens* and easily confused with those of wart disease, on wounded areas of resistant varieties, e. g. Parnassia and Preussen. In carrying out laboratory tests, the author recommends that trials with the semi-immune Rubia variety should be made concurrently for purposes of comparison.

HERIBERT-NILSSON (N.). **Sortsresistens och lokalinfektionsfrihet med avseende på bladrullsjukan hos Potatis.** [Varietal resistance and local freedom from infection in connexion with Potato leaf roll.]—*Weibulls Årsbok*, xxi, pp. 30–33, 1926. [Abs. in *Bot. Centralbl.*, N.F., ix, 7–9, p. 275, 1927.]

In west Skåne and along the south coast of Sweden, leaf roll of potatoes is very prevalent, the Magnum Bonum variety being eliminated by the disease in four years, while the yield of Up-to-Date is reduced by one half in four to five years. After 11 years' cultivation in the midst of susceptible varieties, the Weibullsholm selection, Imperia, remains vigorous, with a 20 per cent. higher production than Up-to-Date. In central Skåne Magnum Bonum shows no sign of degeneration, but the yield of Up-to-Date is already beginning to decrease in the first year of cultivation, although the plants still present a healthy appearance.

SCHWEIZER (G.). **Zur Blattrollkrankheit der Kartoffelpflanze.** [On the leaf roll disease of the Potato plant.]—*Ber. Deutsch. Bot. Gesellsch.*, xliv, 9, pp. 551–561, 5 figs., 1926.

In this study on various physiological aspects of the leaf roll disease of the potato, the author states that he found more diastase in diseased than in healthy plants and that this increased in proportion to the accumulation of starch, thus confirming Neger's results (*Zeitschr. f. Pflanzenkrankh.*, xxix, 1919). The diastase of diseased leaves was found to possess amylolytic power, and an increase in the amylolytic action of the diseased tissue was obtained after the extraction of the reducing sugars.

Injections into the plant of various solutions through glass tubes about 0·5 cm. in diameter, drawn out at one end into a capillary, were made in order to observe their effect on the plants. A nutrient solution containing $Ca(NO_3)_2$ 1·0 gm.; KCl 0·5 gm.; $MgSO_4$ 0·5 gm.; $Ca_3(PO_4)_2$ 0·5 gm., and $FeCl_3$ to cause opalescence, was introduced into one diseased plant, and five others received each of these constituents separately. After 24 days, 4 were dead; that receiving the complete solution showed green leaves at the growing point, but the diseased leaves remained unaltered though a slight tendency to become greener was noticed; while the

plant treated with $Ca(NO_3)_2$ behaved like the last. Injections with sodium and potassium nitrates and ammonium compounds also produced similar results, but certain organic substances, especially albumen and pepsin together, gave rise to striking changes. After four days, all the leaves began to unroll, and this was preceded by a marked green coloration; the leaves at the same time gradually lost their leathery character. There was no subsequent rolling even after the treatments were discontinued. Microscopic examination of the leaves, and iodine tests, showed that starch transference had taken place. In further experiments albumen without pepsin or vice versa also led to recovery, but more slowly. It is not certain whether the action of pepsin is due to its enzyme properties or to albuminous substances which adhere to it. Trypsin injections caused the death of diseased plants and retarded the growth of healthy ones. Peptone and amino compounds cannot bring about the same effect as albumen.

The new phloem produced by diseased plants after recovery did not show necrosis. Chlorophyll activity was found to have ceased entirely in the leaves of severely diseased plants, whereas plants only in the early stages of the disease showed a slight assimilatory activity.

The investigation of oxygen production by the chloroplasts was made by mounting sections in a suspension of a bacterium, methylene blue being added for colouring the latter. It was found that the application of pepsin or albumen led to renewed chlorophyll activity.

TEODORO (N. G.) & BOGAYONG (J. R.). **Rice diseases and their control.**—*Philipp. Agric. Rev.*, xix, 3, pp. 237–241, 1926. [Received 1927.]

The purpose of the present paper is to supply local rice growers with brief descriptions of the chief diseases which attack rice (stated to be the most important cereal crop in the Philippine Islands), and with recommendations for their control. The diseases thus dealt with are: blast caused by *Piricularia oryzae* [*R.A.M.*, i, p. 343]; *Helminthosporium oryzae* [ibid., ii, p. 230]; *Sclerotium oryzae* [ibid., iii, p. 174]; *S. rolfsii* [ibid., i, p. 133]; straighthead [ibid., i, p. 83]; *Ustilaginoidea virens*; *Tilletia horrida*; a stem rot caused by an undetermined species of *Rhizoctonia*; and a brown spotting of the rice grains caused by species of *Fusarium* and *Macrosporium*.

[ASHPLANT (H. T.).] **Secondary leaf fall disease of Rubber. Investigations into methods of preparing Bordeaux and Burgundy spraying mixtures.**—*Planters' Chron.*, xxii, 9, pp. 115–126, 1927.

The good results obtained in South India from spraying with Burgundy mixture against the secondary leaf fall disease of rubber [*Phytophthora meadii*] led to a closer study of the best methods for its preparation and the following formula is now recommended: copper sulphate, 5 lb.; sodium carbonate, 6¼ lb. (or soda ash 2·8 lb.); water, 50 gallons. The usual Bordeaux mixture used on *Hevea* is said to be 4–4–50, though 2 lb. of fresh quicklime

is sufficient to neutralize the copper sulphate. The quicklime used in the locally made mixture is obtained by burning marine shell dredged from the lagoons, but this is sometimes alleged to be inferior. Experiments on the effect of using stale lime in the preparation of Bordeaux mixture showed that this lime failed to neutralize its equivalent quantity of copper and more had to be added. The resulting mixture was, however, totally unsatisfactory, and it is stated that if the quicklime used is such that more than 4 lb. of it is required to neutralize 4 lb. of copper sulphate, the mixture will be worthless as a spray. Under estate conditions it was estimated that lime should be considered stale and worthless 5 or 6 days after burning. The quality of Bordeaux was not appreciably affected when made up with unclean water.

Owing to the insufficient development of cuticle on immature *Hevea* leaves the adherence of Bordeaux is unsatisfactory and the addition of some adhesive substance is necessary for about the first three weeks of the spraying season. Laboratory tests, followed by the experimental spraying of *Hevea* foliage, showed that the addition to the Bordeaux mixture of resin soda adhesive (1 gall. to 50 galls. fungicide) gave very good results, though molasses, casein, and to a lesser degree sodium silicate also improved its adhesive powers to some extent. Burgundy mixture, which has a greater covering capacity than Bordeaux, was appreciably improved only by the addition of resin soda.

The writer strongly emphasizes the importance of very careful supervision during the spraying of rubber. Owing to the deleterious effects of copper salts on the rubber all possible precautions should be taken to avoid contamination of latex and scrap during spraying operations.

SNOWDEN (J. D.). **'Rot of Hevea cortex' in Uganda.**—*Uganda Dept. of Agric. Circ.* 17, pp. 13–22, 1 chart, 1926.

Following the resumption a few years ago of the tapping of rubber trees [*Hevea brasiliensis*] in Uganda, a rot of the tapped cortex which was hitherto considered of minor importance is now becoming increasingly prevalent and more serious in that country. The disease appears a short distance above the tapping cut, in the form of long, depressed patches which become covered with the mycelia and spores of various fungi. Isolations from the lesions showed the constant presence in the affected tissues of *Fusarium* spp. (including *F. udum*), *Cephalosporium* spp., and *Cladosporium* spp. Inoculations of tapped surfaces with *F. udum* and a species of *Cephalosporium* isolated from the trees gave a high percentage of infection, especially when the trees were crowded and undergrowth dense. The author considers that the primary cause of the disease is careless tapping in which the wood is exposed, this allowing weak parasites to gain an entrance, after which they are able to damage the surrounding cortex and cause serious injury to the trees. In a few cases a species of *Sphaeronema* closely agreeing in its morphology with *S. fimbriatum* [*Ceratostomella fimbriata*] described from Malaya [*R.A.M.*, v, p. 184] was also found associated with the rot, but it is considered to be a saprophyte, as it only occurred on the exposed wood.

The disease is best prevented by avoiding injury to the wood when tapping the trees, but as this is difficult to attain under Uganda conditions, the author recommends two applications a fortnight apart of 10 per cent. agrisol or brunolinum plantarium to cure the disease, followed by applications of a 3 per cent. solution at fortnightly intervals as long as conditions are favourable for its spread. In addition, the undergrowth should be cut down frequently, to allow a free circulation of air around the base of the trees.

WAKSMAN (S. A.). **Cellulose and its decomposition in the soil by micro-organisms.**—*Intern. Rev. Sci. and Pract. of Agric.*, N.S., iv, 4, pp. 759–770, 1926.

The present paper is a summary of the investigations on the decomposition of celluloses by micro-organisms which have been carried out up to date at the Department of Soil Chemistry and Bacteriology of the New Jersey Station by the author and his collaborators, and most of which were noticed from other sources [*R.A.M.*, iii, p. 681; iv, p. 240; v, pp. 317, 763; vi, p. 52].

RIOLS (P.). **Le mildiou du Houblon en Bourgogne et nos essais de traitement en 1926.** [Hop mildew in Burgundy and control tests in 1926.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 281–292, 1926.

The downy mildew of the hop (*Pseudoperonospora humuli*) is stated to have continued its attacks in the Côte d'Or (especially in Burgundy) during 1926 [*R.A.M.*, v, p. 694]. Atmospheric conditions appear to have a definite influence on the disease. During a wet period the intensity of infection increases whilst during dry conditions it decreases, permitting in some cases an appreciable harvest. When a rainy period follows dry weather, however, the disease spreads with rapidity. Varieties with green stems appear more susceptible than those with red stems.

A series of tests [which are described in detail] carried out on the variety Hagenau on the control of this disease have led to the following conclusions. Soil treatment with dilute sulphuric acid appears to act as a preventive, but the correct time for application, the concentration of the solution, and the dose required still remain to be determined. Treatment with copper sprays, including neutral Bordeaux mixture 1·5 per cent., neutral Burgundy mixture 1·5 per cent., and copper acetate mixture (0·5 kg. per 100 l.) proved more or less effective, especially in the case of Bordeaux mixture, but Burgundy mixture caused serious injury to the leaves. The importance of collecting and burning affected shoots at the first sign of disease is emphasized.

LANG (W.) & ARKER (H.). **Beobachtungen über die Hopfen-Peronospora im Jahre 1926.** [Observations on the downy mildew of Hops in 1926.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 2, pp. 13–15; 3, pp. 27–28, 1927.

Since its first record in 1924 downy mildew of hops [*Pseudoperonospora humuli*: *R.A.M.*, vi, pp. 52, 119] is stated to have spread rapidly in Germany, and to have reached epidemic propor-

tions in 1926, when climatic conditions in the spring and early summer, namely, continuous rainfall and lack of sunshine over a period of about ten weeks, were exceptionally favourable to the development of the fungus. The disease appeared as soon as growth commenced towards the end of March, when the stocks produced more or less heavily attacked shoots showing the usual symptoms; later on conidia of a somewhat darker, smoky-grey colour and larger dimensions than hitherto observed were freely formed on the leaves. Although the diseased shoots were for the most part immediately removed as they appeared, the remainder soon became infected, while the bines attacked lost their twining habit and consequently their training became a very difficult task. With the onset of dry weather at the beginning of August, the progress of the disease was checked, and comparatively few cones were destroyed, although the crop was considerably reduced in quantity and quality.

Considerable variations were observed in the incidence and intensity of the disease in individual varieties of hops, even in the most susceptible such as the Hallertauer and Württemberger (Rottenburger) late varieties, but in no case was complete immunity observed. Hop gardens in low-lying, damp positions appeared to suffer more than on higher and drier ground. The method of cultivation also appears to exert some influence, as hops trained on wires seemed to be less severely attacked than those trained on props. There were indications that old stocks were more susceptible than younger ones, the susceptibility being apparently increased by excessive nitrogenous manure. The comparatively high losses to the crop sustained in 1926 are partly attributed to the lack of experience on the part of the growers in spraying, as it was noticed that hop gardens which were timely and regularly treated remained remarkably free from the disease while neighbouring ones suffered heavily. Experiments showed that 1 per cent. Bordeaux mixture may be safely applied during and after pollination. The number of applications depends entirely on weather conditions, the best results in 1926 having been obtained with as many as 12 to 15 treatments. As preventive measures, the immediate removal and destruction of all infected material, adequate manuring, and late cutting back of the stocks are advocated.

The authors believe that the suggested connexion between the hop downy mildew and that on the nettle [*P. urticae*] demands further investigation, as nowhere could they find any diseased nettles in Germany, even in the immediate neighbourhood of heavily infected hops [*R.A.M.*, vi, p. 119.]

BELL (A. F.). **Sugar-cane diseases of North America and the West Indies.**—*Queensland Agric. Journ.*, xxvii, 2, pp. 99–104, 1927.

The writer is a Travelling Research Scholar appointed by the Commonwealth Government to study the diseases of sugar-cane in the United States and West Indies. In Louisiana the two standard varieties D 74 and Louisiana Purple are almost wholly infected by mosaic, the uncontrollable spread of the disease being due apparently to the practice of growing maize adjacent to or in mixed cultivation

with cane; *Aphis maidis*, the vector of the disease, was found in abundance on the maize. It is hoped to replace the susceptible varieties gradually by resistant seedlings furnished by the breeding and propagating station at Canal Point, Florida; it is possible, however, that sugar beet may eventually largely replace cane in Louisiana. In Cuba, which has relied on the variety Crystalina, a high proportion of mosaic infection can be found only in the fields of the farmers (colonos) who are in the habit of using the poorest canes for planting; the large estates are adopting effective measures of control. In Porto Rico successful control has been effected on the large plantations by establishing nurseries for seed, by careful seed-piece selection, and thorough roguing of the young canes.

Gumming disease (*Bacterium vascularum*), which was detected in Porto Rico in 1920, is now present in most districts of the island but is causing little injury as a number of resistant varieties are available and the susceptible Cana Blanca (Otaheite), Rayada, and Crystalina are going out of cultivation. The disease was seen by the writer in the eastern districts in 1926 and showed the leaf and stem symptoms characteristic of gumming in Australia but not the leaf markings which were described by Matz as typical. In Porto Rico the disease appears to be transmitted by cane knives, but no evidence pointing to an insect carrier has been obtained; the practically immune S.C. 12·4 and the highly resistant B.H. 110/12 are now being planted widely.

Eye spot (*Helminthosporium sacchari*) has been severely injurious on susceptible varieties like D. 109 and H. 109 following periods of heavy rainfall during the winter months. Dry top rot (*Plasmodiophora vascularum*) is also mentioned as being widely distributed in Porto Rico and as being one of the factors limiting the number of ratoon crops which can be taken. A brief reference is made to the occurrence of mosaic in the British West Indies and the presence of gumming disease in St. Kitts [*R.A.M.*, v, p. 518].

KELLY (N. L.). **Cane pests and diseases.**—*Queensland Agric. Journ.*, xxvii, 2, pp. 82–83; 96–98; 1 pl., 1927.

In the first of these reports, dated 23rd December, 1926, the author states that in the Bundaberg and Maryborough areas of Queensland gumming [*Bacterium vascularum*], mosaic, and Fiji disease [*Northiella sacchari*] cause appreciable injury to sugar-cane. Gumming disease is serious in the varieties N.G. 15 (Badila) and M. 1900 and to a less extent in D. 1135 and N.G. 16. Mosaic disease was observed on E.K. 28, Q. 813, and Shahjahanpur 10, the last-named being an undesirable variety on account of its susceptibility; eradication of diseased stools and careful seed-piece selection are expected to be effective in eliminating mosaic from these areas. Both M.1900 and D. 1135 are very susceptible to Fiji disease, infected stools soon becoming a total loss; stools appearing healthy in fields where disease is present cannot be depended on to furnish healthy cuttings, as the plants may not show the characteristic leaf galls until six months or more following infection. To prevent the further spread of this disease ploughing out infected ratoon fields after harvest, periodical

inspections of infected fields, eradication of diseased stools and the avoidance of attempts to select clean seed in infected fields, especially of D. 1135 and M. 1900, are recommended.

The second report, dated 23rd November, 1926, refers to diseases in the Cairns and Mossmann districts. Leaf stripe [*Sclerospora sacchari*] was found in 7 R. 428 (Pompey), D. 1135, B. 147, Q. 813, and the resistant N.G. 24 A. Cane planted with lightly infected 'seed' rarely shows leaf symptoms until 9 months old, so that there is danger from selecting cuttings in a slightly infected field, owing to the long incubation period; it is recommended that 'seed' be taken from fields set aside as nurseries in which the cane can be inspected frequently and thoroughly. Leaf scald [*Bacterium* sp.] occurs mainly on H.Q. 426, N.G. 24, and N.G. 15 (Badila), while gumming was found in one locality on 11-months-old plant cane of H. 109; in North Queensland the latter disease causes the stalks to die off gradually from above downwards, while leaf scald causes a rapid wilting. Mosaic was present in single fields on H. 109, Shahjahanpur 10, and H.Q. 426.

COOK (M. T.). **Relationship of Cane varieties to diseases.**—*Journ. Dept. Agric. Porto Rico*, ix, 4, pp. 277–281, 1925. [Issued 1927.]

In the present brief note the author points out the complexity of the problem which faces the breeder of new varieties of plants in general, and of sugar-cane in particular, from the point of view of their relationship to disease. Besides the well-known fact that a seedling from parents resistant to a given disease may prove to be highly susceptible to the latter, it must not be overlooked that a disease hitherto regarded as insignificant may find such a congenial host in a new variety as to become suddenly of major importance, or a disease formerly only attacking grasses may find the new variety of cane to its liking and develop into a serious menace. As examples of this are cited mosaic, which is thought to have existed previous to the first report from Java in 1890 and which cannot be easily proved to have spread from there to other cane-growing countries; dry top rot (*Plasmodiophora vascularum*) [*R.A.M.*, vi, p. 148], which is only found in Porto Rico, especially on D. 109, and the origin of which is unknown; eye spot [*Helminthosporium sacchari*] which may have existed in Porto Rico for centuries but has only come into prominence since 1923, probably owing to the introduction of new susceptible varieties of cane; in Hawaii this disease is most severe on H. 109, but in Porto Rico a number of varieties, such as D. 109 and FC. 306 are stated to be more susceptible; and gummosis [*Bacterium vascularum*] which was first found in Porto Rico in 1920, although known in Australia twenty-five years earlier. All these diseases may be efficiently controlled by the use of resistant varieties, but records show a dozen or more minor diseases of sugar-cane in Porto Rico, any one of which may become of importance if it finds a suitable variety, and it is therefore thought that the development of new varieties will very probably bring into prominence some of these minor troubles.

STOREY (H. H.). **Interspecific cross-transmission of plant virus diseases.**—*South African Journ. of Science*, xxiii, pp. 305–306, 1926. [Received April, 1927.]

Streak disease of maize has been readily transmitted from infected to healthy plants by the agency of *Balclutha mbila* [*R.A.M.*, v, p. 188], but attempts to transmit the disease from maize to Uba sugar-cane have given no permanent infections. Transmission from streak-diseased to healthy Uba cane plants was also experimentally obtained with *B. mbila*. Cross-transmission tests from Uba cane to maize produced in the latter a disease generally resembling ordinary maize streak, but readily distinguishable from the latter by the small size and sparse distribution of the chlorotic areas on the leaf. Streak disease, as it occurs in the field on *Eleusine indica* and *Digitaria horizontalis* was transferred to maize, on which it produced types of the disease intermediate between the normal and the sparse.

These observations suggested an attenuation of the streak virus in its passage through different hosts, similar to that recorded in the case of curly leaf of sugar beet [ibid., v, p. 339], but the virus from sugar cane was passed five times in succession through maize plants without any perceptible alteration of virulence.

Infection with the sparse form of the virus was shown to confer no immunity from infection by the normal form, either on maize or on the insect vector, *B. mbila*.

In some of the transmission experiments from maize to cane, the plants developed a few chlorotic stripes resembling the early symptoms of streak, and uninfective leafhoppers, fed on these areas, were able to produce normal streak in maize. The canes, which subsequently produced only healthy foliage, evidently outgrew the initial infection. Similar cases of recovery were observed in the variety P.O.J. 213 growing near diseased Uba cane [ibid., vi, p. 55], the plants developing typical streak markings which later disappeared. Transfer from these spots to maize resulted in the sparse form of streak.

STOREY (H. H.). **Recent researches on plant virus diseases.**—*South African Journ. of Science*, xxiii, p. 307, 1926. [Received April, 1927.]

In studies of streak disease of maize [see preceding abstract] the writer failed to transmit infection by any method of direct inoculation, using juice from diseased maize plants and from crushed infective leafhoppers (*Balclutha mbila*) which in nature are extremely active vectors of streak.

A period of non-infectivity following immediately upon feeding on diseased plants was demonstrated in *B. mbila*. Incubation periods of the virus in the insect were determined at different temperatures and were of the same order as those found by American investigators with the sugar beet curly leaf virus in *Eutettix tenella* [*R.A.M.*, iv, p. 77].

Infectivity was rarely lost by the individuals of *B. mbila* under experiment. One insect remained infective to maize after four months' continuous feeding on healthy sugar-cane.

Measurements of the rate of movement of the streak virus down

the leaf after inoculation showed rapid downward migration, the highest figure obtained being 40 cm. in three hours at 30° C.

Using a technique which limited the feeding of the hopper to chosen leaf areas, it was shown that the distribution in the diseased maize plant of the streak virus was uneven. Whereas 70 to 80 per cent. of hoppers obtained the virus after a short period of feeding on the chlorotic areas, 15 per cent. obtained it from the green portions, including the intermediate zones between the infected and healthy areas. In this partial localization of the virus to the chlorotic leaf areas, streak disease is thought to show similarity with Baur's infectious chlorosis of the Malvaceae.

SERRANO (F. B.). **The red-rot disease of Sugar cane and its control.**—*Philipp. Agric. Rev.*, xix, 3, pp. 263–265, 1926. [Received 1927.]

A brief, popular account is given of the symptoms of red rot of sugar-cane (*Colletotrichum falcatum*) [*R.A.M.*, ii, p. 109] which is stated to be prevalent in Belayan, and in some other localities of the Philippines. The control measures recommended include planting resistant varieties (although no variety is known to be definitely immune); the selection of disease-free cuttings for planting; avoiding the ratooning of infected fields; the installation of proper drainage; crop rotation; the elimination of sources of infection and of boring insects; and the prohibition of exporting any sugar-cane material, except the finished product, from localities where the disease is known to exist.

KUYPER (J.). **Roodsnot, roodrot, ananasziekte, bibit-disinfectie.** [Red smut, red rot, pineapple disease, disinfection of setts.]—*Meded. Proefstat Java Suikerind.* 23, pp. 970–975, 1926.

The symptoms of the following diseases of sugar-cane occurring in Java are described: pineapple disease (*Thielaviopsis ethaceticus*) [*T. paradoxa*], red rot (*Colletotrichum falcatum*), ring spot (*Leptosphaeria sacchari*), gumming disease [*Bacterium vascularum*], and djamoer oepas [*Sclerotium* sp.]. The last-named produces in very wet weather large, diamond-shaped, brown spots on the leaf sheaths and leaves, while in severe cases the stem tissues may be destroyed. Infection is spread by sclerotia which are highly resistant to drought. Diseased shoots and the lowest leaves of the parent cane should be removed.

Notes are given on the disinfection of setts by painting the cut ends with coal tar, as well as by immersion in Bordeaux mixture.

TENGWALL (T. A.). **Wortelrot en bibitrot.** [Root rot and decay of setts.]—*Meded. Proefstat. Java-Suikerind.* 23, pp. 930–937, 1926.

The symptoms of root rot of sugar-cane [*R.A.M.*, ii, p. 526] are briefly described and the disease is assigned to three causes, namely, defective drainage (producing the most typical symptoms), decay of the setts, and other factors as yet incompletely understood. The type of rot caused by excess of water in the sub-soil generally

occurs when the canes are fully matured, i. e., at the age of five to six months. Cases are cited in which improved drainage has completely eliminated the disease even in the susceptible EK 28 variety.

Two forms of sett decay are distinguished, namely, the acetic and butyric acid types, the former resulting from the activity of aerobic bacteria and the latter from anaerobic bacteria. Setts affected by the former and most prevalent type of rot show a dark brown discoloration of the extremities and red spots in the internodal tissues. The eyes die before or immediately after germination. Butyric acid rot occurs after heavy rains when the setts are buried under thick layers of soil. This type was very severe in July, 1923, causing heavy losses. Young plants are speedily killed by the penetration of the butyric acid into the shoots.

The practice of crop rotation is discussed with special reference to the alternate cultivation of EK 28 with SW 111 and other varieties. This method is now becoming quite general in central Java [*R.A.M.*, v, p. 583], and there is some evidence that the condition of EK 28 crops may be considerably improved by its adoption. However, it is regarded as useless to replace this prolific yielder by inferior varieties, since no degree of resistance to root rot can compensate for small harvests.

VAN BREEMEN (P. J.). **Strepenziekte en bladluizen.** [Mosaic and aphids.]—*Meded. Proefstat. Java-Suikerind.* 23, pp. 910–912, 1926.

In connexion with his inquiry into the rôle of *Aphis maidis* in the transmission of sugar-cane mosaic in Java [*R.A.M.*, vi, p. 120], the writer gives a brief account of the life-history of the insect. The method used in the estimation of the relative abundance of *A. maidis* and other insects [loc. cit.] is recapitulated. In 1926 the maximum number of aphids were caught in specially constructed traps during the latter part of January both in the Tegal and Kediri districts. The importance of careful seed selection is briefly indicated.

KUYPER (J.). **Bibittuinen; selectie op sereh- en strepenziekte.** [Nursery gardens; selection against sereh disease and mosaic.] —*Meded. Proefstat. Java-Suikerind.* 23, pp. 949–955, 1926.

After a general discussion of the principles involved in the establishment of nursery gardens for sugar-cane setts in Java, the writer outlines the methods of selection against mosaic and sereh disease [*R.A.M.*, v, pp. 328, 329], the symptoms and etiology of the latter being briefly described. In no case should more than 1 to 2 per cent. infection by sereh disease be allowed in a nursery garden. The practice of treating diseased cuttings with hot water [loc. cit.] has the drawback of reducing germination by as much as 40 per cent., and the value of setts which have been artificially cured is by no means equal to that of selected healthy material.

A brief account is given of the transmission of mosaic disease by *Aphis maidis* [see preceding abstract]. Nursery gardens in which the amount of mosaic exceeds 20 per cent. should be abandoned.

González Fragoso (R.) & Ciferri (R.). **Hongos parásitos y saprofitos de la República Dominicana (9ª serie).** [Parasitic and saprophytic fungi of the Dominican Republic (9th series).] *Bol. R. Soc. Esp. Hist. Nat.*, xxvii, 2, pp. 68–81, 16 figs., 1927.

Of the 32 species dealt with in the present series [see above, p. 321], 18 are described as new species ad interim. Of these may be mentioned *Haplosporella palmaceae* on petioles of an undetermined palm, *Septoria palmaceae* on dry leaves of an undetermined palm, and *Cercospora solani-torvi* on living leaves of *Solanum torvum*. *Oidium erysiphoides* f. *crotalariae* Cif. & Frag. occurs on the leaves of *Crotalaria* sp.

Buisman (Christine J.). **Root rots caused by Phycomycetes.**— Thesis, University of Utrecht, viii + 51 pp., 2 pl., 12 figs., 1927.

In an introductory chapter on the taxonomy of the Peronosporaceae the writer points out that the genera *Pythiomorpha* and *Blepharospora* cannot be considered as distinct from *Phytophthora*, as the characters on which these genera were founded are common to certain representatives of the last-named genus. *Pythiacystis* has already been shown to be the same as *Phytophthora* [*R.A.M.*, v, p. 5]. *Pythium* and *Phytophthora*, although theoretically the same genus, are better considered in general practice as separate genera. The author criticizes the physiological classification suggested by Leonian [ibid., v, p. 4] on the grounds that it is difficult to carry out in practice and that it is almost impossible to cultivate fungi under the same physiological conditions in different parts of the world.

A root rot of Calla lily [*Zantedeschia aethiopica* var. *minor*], causing serious damage in nurseries in Holland, was investigated. The plants are placed in hothouses at the beginning of winter and diseased individuals start to fade in December; the outer leaves show a yellow discoloration which slowly spreads over the whole leaf, and the inner leaves also become gradually affected. The flowers are few and small. On examination the roots are found to be readily broken off and only small pieces remain attached to the corm. The causal organism was isolated and proved to be a new species of *Phytophthora* which is named *P. richardiae*, a diagnosis in English being given. It differs from *P. cinnamomi* in the absence of chlamydospores, and from *P. cryptogea* and *P. cambivora* in the size of the oogonia, which measure 34 to 38 μ; the oospores are about 29 μ in diameter. Its pathogenicity was established by inoculation experiments on corms. In controlling this disease success has been obtained by soaking the corms in a solution of formalin 1 to 49, which has also proved successful in England against a soft rot of *Arum*, said to be caused by *Bacillus aroideae* [ibid., iv, p. 608].

Pythium intermedium was isolated from chrysanthemum cuttings suffering from a root rot. Inoculation of chrysanthemum and geranium cuttings with this species, as well as with *P. splendens*, *P. complectens*, *P. de Baryanum*, and *P. de Baryanum* var. *geranii*, showed that all these, with the exception of *P. complectens*, were strongly pathogenic to geranium, but much less so to chrysanthemum. The controls remained healthy.

A new species, *Pythium irregulare*, an English diagnosis of which is given, distinguished from *P. de Baryanum* only by the irregular shape of the oogonia, was isolated from the roots of peas. Inoculation proved it to be the cause of a root rot of these plants. *Aphanomyces euteiches*, which causes a similar disease of peas in America [ibid., vi, p. 9], was never seen in the Dutch plants, but inoculation experiments with American cultures showed that it is even more pathogenic than *P. irregulare*.

The disease 'vlasbrand' or flax fire is fairly common in the northern provinces of Holland, attacking chiefly the blue flax. It is a typical wilt disease and when very acute causes large bare patches in the fields. In these areas new plants are small, the leaflets wilt, turn yellow, and the plants appear as if scorched by fire. They may sometimes outgrow the disease but never fully recover. Examination of attacked plants showed relatively few sporangia of *Asterocystis radicis*, which is usually associated with this disease, but oospores of *Pythium megalacanthum* were always present in large quantities in material from various districts. Inoculation of the latter fungus into flax seedlings, care being taken to exclude *A. radicis*, produced symptoms of the 'vlasbrand'. Hence it is suggested that *P. megalacanthum* may, like *A. radicis*, be one of the causes of this disease, further work on which is considered to be necessary.

In these studies on different root rots the author carried out most of the inoculations on plants in water culture (Crone's solution). This method gave excellent results and contaminations with soil fungi were eliminated.

ANDERSON (P. J.) & CLINTON (G. P.). **Tobacco diseases observed in 1925.**—*Connecticut Agric. Exper. Stat. Bull.* 6, pp. 66T–73T, 1 fig., 1926. [Received 1927.]

Notes are given on the following diseases of tobacco observed at Windsor, Connecticut, in 1925. Brown root rot [*R.A.M.*, vi, p. 3] is stated to be the most important disease problem confronting local growers. All through the Connecticut Valley fields are lying fallow or growing other crops because tobacco cultivation has become impossible. In Massachusetts timothy grass [*Phleum pratense*] was found to increase the incidence of brown root rot in subsequent tobacco crops.

Wildfire [*Bacterium tabacum*] was comparatively little in evidence during the period under review, but it would be unwise to assume that it is losing its virulence, and every precaution should be taken to exclude it from the seed-beds.

Angular leaf spot [*Bact. angulatum*] has not yet caused serious damage in New England, and the failure of inoculation experiments justifies the hope that it will not do so.

Hollow stalk [*Bacillus carotovorus*] appears first after topping and reduces the pith of the stalk to a wet, black, rotten mass which later shrivels and dries up. The lower leaves are also affected, the mid-ribs becoming black and sometimes rotting off at the stalk and dropping away.

Damping-off [*Pythium de Baryanum, Rhizoctonia solani*, &c.] occurred most severely on well-grown plants almost ready for

transplanting. Large patches in the beds were completely rotted, these severe cases being constantly associated with unduly dense sowing. Proper sterilization, ventilation, and spraying, together with adequate spacing and moderation in watering, have been found to give good control. Cases have been reported in which damage was caused by too intensive or protracted steaming of the soil.

Mosaic or 'brindle' occurred with extreme virulence round Middletown, in the extreme south of the tobacco-growing district, fully 95 per cent. of the plants being affected. The younger leaves were distorted and wrinkled, and the dark green areas stood out from the surface like large blisters. Altogether the leaves resembled those of peaches attacked by leaf curl [*Taphrina deformans*].

Frenching was reported from a few fields in the Housatonic Valley.

A peculiar injury induced by tarvia fumes from a macadamized road was recorded. The affected plants showed a glistening, varnished appearance, and in a few days marginal strips or irregular intervenal areas of the leaves died off [see also *R.A.M.*, v, p. 644].

Curly dwarf [*R.A.M.*, v, p. 452] was again observed near Windsor Locks.

A physiological disturbance associated with the production of large, brown, dead areas on the leaves was noticed after the mid-season rains on Broadleaf tobacco. The spots, which ranged from one quarter to two inches across, were of the 'star and crescent' type, i.e., small, circular areas surrounded by a slender, curved, dead line.

LESLEY (J. W.). **A study of resistance to western yellow blight of Tomato varieties.**—*Hilgardia*, ii, 3, pp. 47–65, 1 fig., 1926.

The investigation described in the present paper was begun in 1922 with the ultimate object of finding varieties of tomato resistant to western yellow blight [*R.A.M.*, v, p. 598] suitable for cultivation in those regions of California where the disease causes severe losses. Inability to induce the disease artificially materially increased the difficulties of the work and necessitated entire dependence on the highly variable natural development of the disease. Full details are given of the statistical methods employed in ascertaining the resistance of any given variety.

The incidence of the disease varies widely according to the season and the place of trial, but against an attack of moderate severity, in which about half the plants of the widely grown varieties Stone and Santa Clara Canner were blighted during the whole season, Dwarf Champion, Dwarf Aristocrat, and Red Pear showed a fair degree of resistance; they were probably at least 25 per cent. less susceptible than the two first-named varieties. Of other varieties tested, Globe appeared to be somewhat resistant, and Norton comparatively susceptible; the currant tomato) *Lycopersicum pimpinellifolium*) seemed to be somewhat more susceptible than Santa Clara Canner. None of the varieties was sufficiently resistant to survive an attack of extreme severity in the early part of the season. Three years' selection in the commercial variety Santa Clara Canner re-

sulted in strains with resistance about equal to that of the Dwarf varieties and Red Pear.

Hybridization experiments between Dwarf Champion, a variety undesirable commercially because of its small size and soft fruits, and Dwarf Aristocrat on the one hand, and Norton, Santa Clara Canner, and Globe on the other, showed that the resistance factor in the Dwarf varieties is recessive and appears to depend on the gene for dwarfness, or possibly on a gene or genes more or less closely linked with it. The reaction of Red Pear and of selections of standard habit indicates that resistance is not conferred exclusively by the gene for dwarfness. It is considered possible that resistance in these standard varieties depends on genes other than those which produce it in the dwarfs, and attempts are therefore being made to breed by hybridization types with increased resistance.

WEDGWORTH (H. H.). **Leaf blister of Oak.**—*Quart. Bull. State Plant Board of Mississippi*, vi, 2, pp. 10–12, 4 figs., 1926.

The leaf blister disease of oak caused by *Taphrina coerulescens* was epidemic in Mississippi during the spring of 1926, resulting in injury to valuable shade trees. The disease attacks practically all species of oaks, but the water oak (*Quercus nigra*) and the red oak (*Q. rubra*) are very susceptible. The willow oak (*Q. phellos*) showed marked resistance to the disease during 1926. Leaf blister is found commonly throughout the United States, but it causes little damage except in the southern States, where in favourable seasons the growth of infected trees may be impaired and individuals sometimes killed by repeated defoliation. Cool, wet weather during the spring of 1926 may have accounted for the epidemic, and the disease can probably be controlled by early spring spraying with Bordeaux mixture. A brief account of the life-history of the fungus is given.

MOLLEVEAUX (J.). **La faillite du Chêne tardif à Vierzon.** [The impoverishment of the Late Oak at Vierzon.]—*Rev. Eaux et Forêts*, lxiv, 12, pp. 614–617, 1926.

The late or pedunculate oaks [*Quercus pedunculata*] in the Vierzon forest [Loir-et-Cher] are stated to be in imminent danger of extermination as a result of three distinct factors, namely, the severe attacks of caterpillars in 1920 and 1921; the epidemics of *Oidium quercinum* [*Microsphaera quercina*] in the same years; and (to a very much lesser extent) the drought of 1921 [see also *R.A.M.*, vi, p. 198].

SCHWARZ (M. BEATRICE). **Spinnewebziekte bij Mahonie en Djati.** [Cobweb disease of Mahogany and Teak.]—*Korte Meded. Inst. voor Plantenziekten* 2, 9 pp., 4 pl., 1926. [English summary.]

In July, 1926, some branches of 22-year-old mahogany (*Swietenia mahogoni*) trees in Noord Randoeblatoeng, Java, were found to be attacked on the under side by the so-called 'cobweb disease'. The affected parts were covered with a strong, white, mycelial cord, which occasionally divided, forming a network increasing in density towards the top. Lateral branches of this cord overgrew the

petioles and eventually covered the whole under side of the leaves, which withered and turned brown.

The mycelium is composed of thin-walled hyphae with few septa and regular, brown, swollen anker cells with one or more points. The ends of the most slender hyphae show peculiar swellings, which stain with eosin red. Clamp-connexions occur, but no fruiting bodies have been found. The hyphae penetrate the branches and leaves.

Teak (*Tectona grandis*) leaves suffering from cobweb disease develop on the under side a white mycelium originating from a thick, light brown cord following the main vein and petiole. Owing to the presence of leaf hairs and also of a lustre due to the higher air content of the infected cell layers, the mycelial cord is somewhat inconspicuous. Branches and leaves are penetrated, the latter dying and turning brown, thin, and papery. The mycelium resemble that of the mahogany fungus, except in the irregularity of the anker cells and the absence of clamp-connexions. Fructifications were not observed.

White mycelia are known to occur on different hosts. Petch's classification of the thread blights [*R.A.M.*, iv, p. 66] is outlined and discussed, and a slightly modified alternative scheme is recommended in which the names 'thread blight' and 'white stem blight' [ibid., vi, p. 116] are replaced by 'cobweb disease' and 'false pink disease', respectively. The fungi on both mahogany and teak possess anker cells and belong, therefore, to the marasmioid group of thread blights. The teak fungus in Java is said to differ from that occurring in Ceylon by its anker cells.

Control of downy mildew and Phylloxera in Vines.—*New Zealand Journ. of Agric.*, xxxiv, 2, p. 143, 1927.

The following regulations for the control of downy mildew [*Plasmopora viticola*] of the vine were gazetted in New Zealand on 13th January, 1927, and came into force on that date.

The removal of vines from a certain prescribed area in the north of New Zealand [*R.A.M.*, vi, p. 11] to any other part of the country is prohibited. Further, vines bearing fruit, leaves, immature wood, or having soil on the root may not be moved from one locality to another within the same area. A fine not exceeding £20 may be imposed for non-compliance.

Importation of Elm trees (Prohibition) Order of 1926.—Statutory Rules and Orders, 1926, No. 1636, 1 p., 1927.

This Order, dated 23rd December, 1926, prohibits the importation into England and Wales of elm trees from continental Europe from 15th January, 1927, with the object of preventing the introduction of such diseases as *Graphium ulmi* and *Micrococcus ulmi*.

Importation of Elm trees (Prohibition) (Scotland) Order of 1927.—Statutory Rules and Orders, 1927, No. 31/S. 3, 1 p., 1927.

This Order, dated 15th January, 1927, is a similar Order to that noticed in the preceding abstract but applies only to Scotland. It came into force on 1st February, 1927.

IMPERIAL BUREAU OF MYCOLOGY

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BRUSSOFF (A.). **Die Ulmenkrankheit und ihr Uebergreifen auf Rotbuchen und andere Baumarten.** [The Elm disease and its spread to Copper Beeches and other kinds of trees.]—*Zeitschr. für Forst- und Jagdwesen*, lix, 3, pp. 147–152, 1927.

The writer reviews his own work and that of other investigators in connexion with the elm disease first observed in Holland [*R.A.M.*, vi, p. 263], and furnishes some additional data on the spread of the epidemic in Germany. The disease has been observed in various parts of the country from Königsberg [East Prussia] to Munich, the most recent host in the Aix-la-Chapelle district being *Crataegus oxyacantha*. The symptoms of the disease on the various hosts are briefly described, and a short account is given of the morphology, cultural characters, and mode of infection of the organism (*Micrococcus ulmi*) believed by the author to be responsible for the disease. In the majority of cases infection appears to take place through small wounds in the roots, but partial infection may develop from wounds on the trunk or branches, the organism being carried upwards in the transpiration current. *M. ulmi* is stated to be extremely widespread in the soil even in the absence of elms. The watermark disease of willows [ibid., iv, p. 321] is believed to be distinct from the elm disease.

BOYCE (J. S.). **Decay in northwest timber.**—*Columbia Port Digest*, iv, 2, pp. 8–9, 2 figs., 1926.

In the present paper, brief popular descriptions are given of the principal rots which attack living trees in the Pacific northwest, the damage done by them in northern Idaho and western Montana being very considerable. The rots described include *Trametes pini* (stated to be by far the most destructive), *Fomes laricis*, *F. roseus*, and *Polyporus schweinitzii* on the Douglas fir (*Pseudotsuga*

taxifolia); *Echinodontium tinctorium* on the western hemlock (*Tsuga heterophylla*); *Polyporus schweinitzii* and *Trametes pini* on Sitka spruce (*Picea sitchensis*); stringy brown rot [*E. tinctorium*: *R.A.M.*, iii, p. 492] of white firs (*Abies concolor* and *A. grandis*); *Poria weirii* on the western red cedar (*Thuja plicata*). The Port Orford cedar (*Chamaecyparis lawsoniana*) is said to be very resistant to all kinds of rots, although it is occasionally attacked by *T. pini*.

BOYCE (J. S.). **Sap-stain and decay in northwest lumber.**—*Columbia Port Digest*, v, 3, pp. 5–6, 1927.

This is a cursory and popular account of the different types of sap stain and decay which affect felled timber in the Pacific northwest. The most important wood stains of fungal origin in the region are stated to be a red stain which is frequently found on Sitka spruce (*Picea sitchensis*) wood, and a blue stain [*Ceratostomella* spp.: *R.A.M.*, ii, p. 185], to which the western yellow pine (*Pinus ponderosa*), western white pine (*P. monticola*), sugar pine (*P. lambertiana*), and Sitka spruce are very subject, while true firs [*Abies*], Douglas fir (*Pseudotsuga taxifolia*), and western hemlock (*Tsuga heterophylla*) are less affected by it. These stains are best controlled by kiln-drying the freshly felled timber and stacking it under a roofing to protect it against rain whilst providing for efficient aeration between the logs. In combination with air-drying, sodium carbonate and sodium bicarbonate, used in hot or cold solution, are widely employed and are of material help in the prevention of sap stains, but strong solutions of these chemicals impart a distinct yellowish or brownish discoloration to the wood. Sodium fluoride does not stain the timber and is slightly more efficacious against blue stain than the former, but is less effective against certain moulds. Mercuric chloride, the best fungicide, is avoided in general practice because of its poisonous and corrosive properties. Common salt is of little value in the prevention of blue stain.

LACHMUND (H. G.). **Studies of White Pine blister rust in the West.**—*Journ. of Forestry*, xxiv, 8, pp. 874–884, 1926.

The present paper gives a popular account of the white pine blister rust (*Cronartium ribicola*), summarizing the published results of investigations in Europe and in North America. Of particular interest is the study of the early history of the rust and of its spread along the western littoral of North America, which substantiates the view that its wide dissemination was due to the infection of *Ribes* species by wind-borne aecidiospores from the pines at 100 miles or more distant; most of these infections of *Ribes* die out, but under favourable circumstances a few result in the establishment of new pine-infection centres. In the west the usual limit of spread from pine to currants appears to be about 150 miles. The southwards extension of infection of *Ribes* species has varied in different years, dependent on weather conditions. In 1922 the southernmost point at which it was found was Ilwaco in the State of Washington; in 1923 and 1924 the rust on *Ribes* was found south only to about the latitude of the southern end of Puget

Sound, while in 1925 it appeared at a number of places, besides Ilwaco, in south-western Washington and at three points in north-western Oregon, the farthest south being 100 miles south of the mouth of Columbia river. This renders the possibility of creating a barrier against the southward advance of the disease out of the question, and the final invasion of the range of sugar pine (*Pinus lambertiana*) in California seems almost inevitable.

Studies on the relative susceptibility and capacity to produce pine-infecting spores of various species of *Ribes* indicate that the red flowering currant (*R. sanguineum*), squaw currant (*R. cereum*), gummy gooseberry (*Grossularia lobbii*), and coast black gooseberry (*G. divaricata*) are congenial hosts for the rust, the first two species being particularly susceptible.

MOLL (F.). **Hausschwammbekämpfung.** [Dry rot control.]—*Mitt. Gesellsch. Vorratsschutz*, iii, 1, pp. 9–12; 2, pp. 24–25, 1927.

After some observations on the urgency of the dry rot [*Merulius lacrymans*] problem in Germany [*R.A.M.*, vi, p. 9], the writer describes, in popular terms, the principal measures for the control of the fungus. Different methods of preservation are recommended for various types of woodwork. Thus impregnation with tar oil is suitable for wood pavings, scaffolding, &c., while in gateways, barns, workshops, laundries, and the like, the wood should be treated with 0·5 per cent. corrosive sublimate or with 2 to 3 per cent. basilite, triolith, or schwammschutz Rütgers [ibid., iii, pp. 241–242; iv, p. 454; v, p. 458]. Brief instructions are given for the application of these preparations.

CLAYTON (E. E.). **Control of seedbed diseases of cruciferous crops on Long Island by the mercuric chloride treatment for Cabbage maggot.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 537, 29 pp., 1926.

Following reports from local growers of striking control of fungal diseases of cabbage obtained through seed-bed disinfection with mercuric chloride as practised on Long Island, New York, for the control of the cabbage root maggot [*Phorbia brassicae*], experiments were made by the author in 1923, 1924, and 1925 with a view to determining the value of this treatment for the control of club-root (*Plasmodiophora brassicae*), black leg (*Phoma lingam*), black rot (*Pseudomonas campestris*), and damping-off (*Rhizoctonia solani*) [*R.A.M.*, iv, p. 9]. Comparative experiments were made at the same time with semesan, uspulun, Bayer compound, and germisan.

The results showed that the club-root organism in the soil was very sensitive to the action of all the mercury compounds, two applications of mercuric chloride in dilutions of 1 in 1,200 to 1 in 2,000 being generally quite effective in its control, while in one experiment a single treatment, of 1 in 1,500, at the rate of 1 gall. to 30 feet of plant row, given at the formation of the first true leaf, reduced the amount of infection from 66·3 in the controls to 2·6 per cent. in the treated beds. It is pointed out, however, that mercuric chloride is more or less toxic to the plants; in the experiments it was most commonly injurious, and the injury was most severe, when weather conditions were hot and dry at the time

of the treatment and for a week or ten days after. Young seedlings were much more easily injured than older plants, and plants given few applications suffered less than those which received frequent applications. Of the three species tested Brussels sprouts were by far the most sensitive to the injury, with cabbage the most resistant and cauliflower intermediate between the two. The organic mercury preparations used proved as effective as mercuric chloride against club-root and, with the exception of germisan, caused less injury to the seedlings. In one set of experiments, while mercuric chloride reduced the number of plants in the bed by almost 30 per cent. as compared with the controls, uspulun increased it by about the same amount. The organic mercury compounds, however, have the disadvantage of being much less effective than mercuric chloride in the control of root maggots.

Two or three seed-bed treatments with any of the above preparations gave marked control of black leg and black rot when the disease was seed-borne, this treatment being as effective as the standard mercuric chloride seed treatment, but less so than the hot water steep. In all the experiments, however, when the source of infection was in the soil, the seed-bed treatment was ineffective; the reason of this failure is believed to be the fact that the disinfectant was not applied to the whole of the seed-bed, but only to the rows of seedlings, thus leaving viable spores in the untreated soil between the rows. The treatment was also ineffective in the case of *Rhizoctonia* damping-off of the seedlings.

SOLBERG (LOUISE). **Visnesyke paa Erter og Blomstererter.** [Wilt of Peas and Sweet Peas.]—Reprinted from *Nord. Jordbrugsforsk.*, 4–7, pp. 698–703, 1926. [Received April, 1927.]

A number of fungi are stated to be responsible for the wilt or root rot disease of peas in Norway, the most injurious being *Aphanomyces euteiches* [*R.A.M.*, v, p. 201], which occurs extensively in the south of the country and has also been found in material from Denmark. The organism has been found constantly present in cultivated soils with a hydrogen-ion concentration ranging from P_H 5·2 to 6·8.

The symptoms of root rot are briefly described [ibid., iv, p. 580]. The oospores are most easily found in tissue scrapings, in transverse sections near the root-collar, or in the slender root fibres. They are enveloped in a thick-walled oogonium measuring about 30 μ in diameter, and are considerably larger than those of the *Pythium*, with which they were confused in the writer's previous report [loc. cit.], so that a number of plants, including clover, beans, and lupin, were erroneously recorded as hosts of *A. euteiches*.

In the writer's inoculation tests, a few deformed oospores were produced in the cortex of the roots of lucerne, clover, and beans, indicating that the fungus is able to subsist in soil rarely used for peas or sweet peas. The fungus can attack plants at any age and spreads with extreme rapidity by means of its zoospores. It forms an immense number of oospores in the roots, so that the soil soon becomes contaminated; affected plants are rendered very susceptible to infection by facultative parasites.

The writer has not encountered *Fusarium martii pisi* [*R.A.M.*, v, p. 462] in Norway, but species belonging to the *avenaceum* type of the *roseum* group have been observed, usually as secondary parasites.

Species of *Pythium*, especially of the *de Baryanum* type, have been constantly isolated from pea roots, but inoculation experiments have shown that the pathogenicity of these organisms is slight.

Rhizoctonia hyphae have occasionally been observed in wilted material. Seedlings grown from seed infected by *Ascochyta* have frequently developed lesions near the attachment of the seed and along the stem. In roots of peas and vetch (*Vicia sativa*) the writer has found hyphae and empty vesicles of an organism corresponding with the mycorrhizal fungus described by Peyronel and F. R. Jones [ibid., iv, p. 301]. Little damage appears to be caused by this endophyte. *Thielavia basicola*, on the other hand, frequently causes very severe damage both under glass and in the open, often in conjunction with *A. euteiches*.

An undetermined fungus belonging to the Olpidiaceae, with polyhedric resting spores measuring about 10 μ, is often found in the outer cells of the epicotyl and upper part of the roots of peas, pansies, asters, and other plants. In the first-named host it is often associated with *A. euteiches*, but sometimes it occurs with another undetermined fungus having hyphae 2 μ in width, which penetrate the endodermis.

Wilting generally appears first in the dampest part of the field, the zoospores of *A. euteiches* requiring moisture for their development. In Norway the disease does not occur until the soil temperature has reached a sufficient level (15° C. at least) in July or August, whereas in Central Europe it is in evidence by midsummer. Early sown peas (25th April to 10th May) make poor growth on account of the low temperature and are therefore more susceptible to infection than those sown later.

Rotation of crops is considered to be undoubtedly the best control measure, while preliminary experiments indicate that nitrogenous manures also exercise a beneficial effect on the peas and thus reduce their liability to root rot.

BERTUS (L. S.). **A sclerotial disease of Groundnut caused by Sclerotium rolfsii Sacc.**—*Year-Book Dept. of Agric., Ceylon, 1927*, pp. 41–43, 1 pl., 1927.

Sclerotium rolfsii was found causing a disease of groundnuts (*Arachis hypogaea*) at Peradeniya, chiefly on plants which also showed infection from *Rhizoctonia solani*, the perfect stage of which (*Corticium vagum*) [*C. solani*] was found on the under surface of some of the apparently healthy leaves. The attacks in the case of *S. rolfsii* alone start from the collar, the leaves and leaf stalks become dried up and withered, but the roots are not affected. The fungus was isolated and grown in pure culture. Details are given of cultural characters, and of the variation in sclerotial size, from 1 to 8 mm. in diameter, due to the effects of different media.

Inoculation experiments were carried out in the laboratory on a number of plants of economic importance. It was concluded

from the results of these that *S. rolfsii* causes a stem disease of groundnuts only under very favourable circumstances, as when the plants are previously infected with *R. solani*. *S. rolfsii* is a weak parasite, and of all the plants inoculated caused a root disease only in the case of the radish. Young seedlings of cotton and certain other plants are susceptible, but become immune when older. A stem rot of mature chilli [*Capsicum annuum*] and tomato plants is caused by the fungus. When buried at a depth of 4 inches, it is capable of coming to the surface and attacking certain plants at the collar, but not if buried deeper. Infected soil may in certain cases cause infected seedlings. Moist atmospheric conditions are necessary for vigorous growth of the fungus.

Control measures recommended for this disease are burning infected plants *in situ* after the nuts have been lifted; collecting and burning all refuse; scraping the surface layers of the soil with a hoe, collecting this material into heaps and burying it in holes 9 inches or a foot deep, so that any sclerotia may be rendered innocuous. As a further precaution, watering the soil surface with a fungicide like Jeyes' fluid (1 oz. to 1 gall. of water) is beneficial.

S. rolfsii has only once before been recorded in Ceylon, on *Vigna oligosperma*. Owing to the similarity of this fungus to *S. zeylanicum* on tea, recorded as rare in Ceylon by Petch, it is suspected that the two are identical.

SCHWARZ (M. BEATRICE) & HARTLEY (C.). **De invloed van de voorvrucht op het optreden van slijmziekte (Bacterium solanacearum) in Arachis hypogaea en eenige andere gewassen.** [The influence of the preceding crop on the occurrence of slime disease (*Bacterium solanacearum*) in *Arachis hypogaea* and some other plants.]—*Meded. Inst. voor Plantenziekten* 71, 37 pp., 1926. [English summary.]

The results of an extensive series of crop rotation experiments [which are fully described and presented in tabular form: see also next abstract] indicate that, under Buitenzorg (Java) conditions, the intensity of slime disease (*Bacterium solanacearum*) in tobacco and tomato is proportionate to that in groundnut (*Arachis hypogaea*) in *Arachis*-sick soils [*R.A.M.*, iv, p. 318]. This statement, however, is not uniformly applicable to *Hibiscus cannabinus*, nor was any correlation observed between the degree of infection in groundnut and the following plants: eggplant (*Solanum melongena*), potato, *Rumex sagittatus*, *Heliotropium indicum*, and *Eleutheranthera ruderalis*.

Repeated cultivation of a susceptible host on the same soil resulted in an increased incidence of infection for that host, but not for all the others tested. The preliminary conclusion is reached, with the additional support of evidence from Deli, Sumatra, that the strain of *Bact. solanacearum* attacking groundnut, tomato, and tobacco at Buitenzorg differs from the one or more strains infecting the above-mentioned species of *Solanum*, *Rumex*, *Eleutheranthera*, and *Heliotropium*, while *H. cannabinus* is susceptible both to the *Arachis* strain and to some of the others.

It is suggested that the conflicting results obtained by some

workers with this organism may be partly explained by their use of highly resistant host species. The varieties of *Arachis* (including Toeban, Witte Bastaard, and Zuivere Lijnzi) used in the authors' experiments possessed a known degree of resistance which facilitated the detection of other factors determining the incidence of infection. The greater susceptibility to slime disease of tobacco at Deli and of groundnut at Buitenzorg has suggested the existence of different bacterial strains in the two cases, but modifications of susceptibility due to climatic and soil conditions are thought to afford a more plausible explanation.

At Lembang (1,250 m. above sea-level) internal infection of groundnut occurs but wilting is very rare. Microscopic examination of such plants showed the same degree of varietal resistance as that recorded at Buitenzorg. Thus at Lembang groundnut is a latent carrier of *Bact. solanacearum*. *Heliotropium indicum* acts in the same way at Buitenzorg.

Strain differences between bacteria should not be too confidently relied upon to protect differential hosts, since adaptation to comparatively uncongenial hosts may gradually be developed.

Few exact data are available as to the viability of *Bact. solanacearum* in the soil. In 1924 *Cassia lechenaultiana* suffered severely from slime disease on soil where coffee had been grown under *Albizzia* for 17 years, and in 1925 *Tephrosia vogelii* was similarly affected on soil which had been in coffee under *Albizzia* for 20 years. *Ageratum conyzoides*, which had been listed as a host of *Bact. solanacearum*, though never observed by the writers to be wilted at Buitenzorg, was present in the latter case.

SCHWARZ (M. BEATRICE). **Voorloopige resultaten van een oriënteerende veeljarige vruchtwisselingsproef op sawahterrein in verband met slijmziekte (Bacterium solanacearum) in Arachis hypogaea.** [Preliminary results of a crop rotation test extending over several years on rice soil in connexion with investigations on slime disease (*Bacterium solanacearum*) in *Arachis hypogaea*.]—*Korte Meded. Inst. voor Plantenziekten* 3, 11 pp., 2 pl., 1 diag., 1927. [English summary.]

Since 1923 a crop rotation test has been conducted on irrigated land (used for rice in the west monsoon) near Buitenzorg (Java), in which groundnut (*Arachis hypogaea*) had been grown consecutively and also in rotation with soy-bean (*Soja hispida*), cowpea (*Vigna sinensis*), chilli (*Capsicum annuum*), eggplant (*Solanum melongena*), sweet potato, maize, and cucumber. The first four of these crops are susceptible to slime disease (*Bacterium solanacearum*), though in a lesser degree than *A. hypogaea* [see preceding abstract].

The preliminary results of these experiments [details of which are given] show that continuous cultivation of groundnuts on irrigated soil in the dry season results in an increased loss from slime disease. The incidence of infection may be adequately reduced by one-year rotation with any of the above-mentioned crops. This indicates a biological difference in the strains of *Bact. solanacearum* on various hosts which is of considerable practical importance in the simplification of the rotation system.

FISH (S.). **Grape export problem.**—*Journ. Dept. of Agric. Victoria*, xxv, 1, pp. 31–38, 5 figs., 1927.

In this paper the results are given of a preliminary investigation on the causes of wastage and the conditions affecting the keeping qualities of Victorian grapes intended for export.

From the numerous specimens of wasty grapes examined, taken direct from the vineyard or cold store, the following fungi were obtained. *Botrytis cinerea*, *Penicillium* sp., and *Rhizopus nigricans* were the predominant fungi found on the berries, and inoculation experiments showed they were all capable of damaging grapes wherever an entrance was gained through wounds [*R.A.M.*, vi, p. 76]. *Penicillium* usually attacks the berries after *Botrytis* has damaged them; *Rhizopus* has been found attacking berries in cold store. *Aspergillus niger* and *Alternaria vitis* occurred on the berries occasionally and *Cladosporium herbarum* was present to a variable extent on the stems, forming a white mycelium which entangles the cork and spoils the appearance of the bunch. Many samples of the cork filler were also found to be heavily infested with *Botrytis*, *Rhizopus*, and *Penicillium* [ibid., v, p. 713].

A description is given of the trial shipments to London made in 1926, which showed that sulphuring the grapes had little or no effect on the control of moulds, and caused a certain depreciation in value. The best price was obtained for fruit which was not sulphured, but where the cork filler had been treated by the hot air and sulphur method [loc. cit.] before shipment. On pp. 17–18 of the same issue Mr. de Castella expresses the opinion that the sulphur noticed on the Spanish grapes was applied for the control of *Oidium* [*Uncinula necator*] and not for the prevention of mould in transit. A comparison of the condition on arrival of shipments exported in the four years 1923–6 indicates that the amount of waste is largely dependent on the rainfall during February and March, which, if heavy, causes rotting fungi to develop in the vineyard. Under wet conditions *Botrytis cinerea* has been seen in Victoria vineyards in February, covering the berries with a grey-brown mycelium which may extend over the whole bunch and result in complete rotting.

As a result of these experiments various tentative recommendations are suggested for the amelioration of the trouble. In the first place the vineyard and packing shed should be kept as clean as possible and all mouldy fruit destroyed; the fruit should be picked when dry and bunches left to hang in a well-ventilated room for at least 24 hours before packing; and the grapes should be handled very carefully to avoid injury and packed in clean cork. The results of experimental shipments in 1926 showed that precooled grapes may be carried without damage at 33° to 34° F.

PETHYBRIDGE (G. H.). **Fungus and allied diseases**—ex *Plant Pests and Diseases in 1926, National Farmers' Union Year Book for 1927*, pp. 162–165, 1927.

Notes are given on the prevalence and control of various diseases of economic crops in England during 1926.

In connexion with a brief statement on black rust of wheat [*Puccinia graminis*] it is mentioned that common barberry [*Ber-*

beris vulgaris] bushes are increasingly in demand for planting purposes, and the risk of spreading infection by this means is briefly explained.

Extended treatment of wheat seed-grain with copper sulphate or formalin for the control of bunt [*Tilletia tritici*] is urged. Dusting with copper carbonate has been found (in preliminary trials) to be reasonably effective in the case of mild infection, but it cannot replace the liquid disinfectants for severe contamination.

Potato blight [*Phytophthora infestans*] was very prevalent, the stems of the plants being attacked as severely as the foliage, or more so. Spraying or dusting is widely practised in Lincolnshire, but in other parts of England the losses are stated to be unnecessarily heavy. Common scab [*Actinomyces scabies*] was less prevalent than usual, but some severe cases of powdery scab [*Spongospora subterranea*] occurred on heavy soil in the north of England and in South Wales. Soil infection is regarded as the primary source of trouble with both these diseases, and no practicable method of disinfection on a large scale has yet been evolved.

The chocolate spot disease of field beans [*Bacillus lathyri*: *R.A.M.*, ii, p. 99] entailed serious losses in 1926. Severe epidemics were reported from the eastern and east-midland counties in late May and June. In some cases the crops were total failures, but late-sown and backward stands remained comparatively healthy.

Celery blight [*Septoria apii*] was unusually widespread. Good results in the control of this disease by spraying with Bordeaux mixture have been obtained in the Haxey district of Lincolnshire.

The apple crop was an almost total failure, partly owing to meteorological conditions. Brown rot [*Sclerotinia fructigena*] was prevalent on the few fruit-bearing apple trees. Czar and Rivers plums were also severely attacked by the disease [*S. cinerea* and *S. fructigena*] in the eastern and south-eastern counties.

Many acres of hops had to be abandoned on account of powdery mildew [*Sphaerotheca humuli*].

Bericht der Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau zu Geisenheim a. Rh. für die Rechnungsjahre 1924 und 1925. [Report of the Viticultural, Pomicultural, and Horticultural College and Research Institute at Geisenheim a. Rh. for the financial years 1924 and 1925.]—*Landw. Jahrb.*, lxiv, Supplement II, pp. 129–205, 1926.

This report, like the previous one [*R.A.M.*, iv, p. 106], is chiefly an account of tests of various fungicides against fruit diseases.

Leaf mould [*Cladosporium fulvum*] appeared on tomatoes growing in the open at Geisenheim and in many other parts of Germany. The rapid increase in this disease since 1923 is traceable to the wet weather of the last few summers. Resistance to it is said to be assisted by wide planting and by the choice of sunny and airy localities.

In 1925 the following fungicides were tested against *Peronospora* [*Plasmopara viticola*] on vines: Horst's copper dust, nosperit dust, nosperit solution, nosperal, nosprasen, kurtakol, and Bordeaux mixture. Bordeaux mixture and nosprasen caused scorching at the first and nosperal at the second spraying. The order of merit of

the fungicides was Bordeaux mixture, nosprasen, kurtakol, nosperal, Horst dust, and nosperit. Kurtakol occasionally caused the foliage to turn yellowish.

Attempts to control mildew [*Podosphaera leucotricha*] on apple trees by treating them in the winter with a 5 per cent. solution of solbar and again on budding with 1 per cent., and when the foliage was fully out with 2 per cent., did not prove satisfactory.

Gooseberry mildew [*Sphaerotheca mors-uvae*] occurred only lightly after spraying with solbar or potassium sulphide, both of which seemed to be equally effective. Solbar diminished peach leaf curl [*Taphrina deformans*] but caused scorching.

Kurtakol applied in a 1 per cent. solution on 3rd April and again at a strength of 0·75 per cent. on 4th June proved effective against pear scab (*Fusicladium*) [*Venturia pirina*] and peach leaf curl, especially the former. On peaches it caused scorching.

Bad mildew on apple trees was diminished by dusting with elosal, the young leaves remaining free of disease at first, but being attacked again later, though to a lesser degree. No opinion could be formed as to the efficacy of this preparation against gooseberry mildew, and it failed to control mildew [*S. pannosa*] and leaf curl on peaches.

A list is given of the apple varieties badly, less badly, scarcely, or not at all attacked by mildew at the Geisenheim Institute during the last few years.

Experiments with zymosan and antorgan (Chemische Fabrik Dr. Nördlinger, Flörsheim) and with the new disinfectant aktivin (Chemische Fabrik Pyrgos, Radebeul-Dresden) showed the germicidal power of the two first-named preparations to be very great. Wine yeasts and most moulds tested can be totally destroyed in 30 minutes in a 0·5 per cent. solution of zymosan, and they cannot survive a 2 per cent. solution longer than 15 minutes at most. The spores of *Penicillium glaucum*, however, were not killed by this concentration in an hour. Antorgan, which may effectively be employed in 5 to 10 per cent. solutions, is rather weaker but quite adequate for technical purposes. Aktivin, an organic chlorine compound (sodium para-toluo-sulpho-chloramide), the disinfecting power of which is attributable to the liberation of oxygen, is an excellent disinfectant, even more effective than zymosan, but *P. glaucum* seems also to be highly resistant to this preparation.

PETRI (L.). **Rassegna dei casi fitopatologici più notevoli osservati nel 1926.** [Review of the principal phytopathological records noted in 1926.]—*Boll. R. Staz. Pat. Veg.*, vii, 1, pp. 1–45, 2 figs., 1927.

The season of 1926 was marked by damp, cool, and cloudy weather from the end of April to the end of June, especially in the north and parts of central Italy, with the result that fungous diseases were unusually prevalent.

Cereals were seriously affected by rusts [*Puccinia* spp.], causing a considerable reduction in yield even in certain regions in southern Italy. Greater damage was, however, caused by foot rot (*Ophiobolus graminis*, *O. herpotrichus*, and *Leptosphaeria herpotrichoides*)

following the frosts of January and the relatively high temperature in February [*R.A.M.*, v, p. 662]. Wheat blight (*Gibberella saubinetii*) was also widespread and was evidently favoured by the prevailing weather conditions. The variety Francesco Strampelli was particularly badly attacked. On wheat infested with foot rot or other diseases, a fungus referred to *Acremoniella occulta* (which is thought to be identical with *Basisporium gallarum* and *Monotospora oryzae*) was frequently found. A mutualistic symbiosis is stated to exist between this fungus and the mite *Pediculopsis* and a similar case is represented by the co-existence of *Fusarium* (*Sporotrichum*) *poae* and the mite *P. graminum* on carnation and Gramineae.

A short note is given on the toxic action of factory emanations (especially chlorine) on lucerne (*Medicago sativa*), similar effects being also observed on various vegetables growing in the vicinity. *Rhizoctonia violacea* [*R. crocorum*] caused much damage to asparagus on the Roman Campagna, where a deficiency in lime is believed to have a predisposing influence. It is of interest to note that asparagus growing near the Acqua Albule sulphur springs is completely immune from this disease, which suggests that sulphuretted hydrogen may have a direct effect on the fungus. The same phenomenon was observed in the case of celery and the fungus *Septoria apii*.

Degeneration diseases of potatoes, especially leaf roll and, less frequently, 'arricciamento' [curling], were prevalent in the Tanaro valley, where cultivation is exceedingly primitive. Mosaic was not found, but streak appears to be present.

Phyllosticta sp. and the white spots attributed to *Bacillus maculicola* were found on leaves of tobacco in Siena; traces of mosaic were seen on the same leaves.

Cotton rust (*Kuehneola gossypii*) [*K. desmium*] was reported from Somaliland.

Besides the more common diseases of the vine, numerous cases of apoplexy or esca due to *Polyporus igniarius* [or *Stereum necator*: ibid., v, p. 592] were reported near Taranto. The acid condition of the soil is thought to have favoured the attack.

In Reggio, Calabria, olive stem rot due to *Fomes fulvus* var. *oleae* was found in trees raised from seed and grafted, the mycelium apparently penetrating at the point of union of the graft, which was badly executed. Olive trees in this region and in Basilicata were also attacked by *Macrophoma dalmatica*.

Quinces were attacked by *Sphaeropsis malorum* [*Physalospora cydoniae*], which has not up to the present caused any serious damage in Italy.

Silver leaf of peaches has, since 1924, become prevalent in the orchards of Ravenna and Bologna. A full description of the symptoms is given, but the fact that neither *Stereum purpureum* nor any other fungus has been detected in connexion with this disease leads the author to maintain his earlier conclusions [ibid., iii, p. 46] that this disease, in Italy, may be of non-parasitic origin and connected with profound physiological disturbances in the plant induced by external influences. Of the methods of control tested, only iron sulphate (2 kg. per plant or a 1 per cent. solution

applied as a spray) has given a slight improvement in the state of the trees.

Notes are given from the Cattedra Ambulante di Agricoltura, Messina, on a serious orange root rot attributed to a species of *Phytophthora*. The leaves of affected trees turn yellow and fall off, and the branches dry up. The wood at the base of the trunk is brown under the bark and shows signs of gummosis. This condition extends down into the main roots which become rotten; in the early stages, the rot may be limited to one or two isolated roots on one side only of the tree, corresponding to that showing the above-ground symptoms. Two fungi were isolated from diseased material, one of which appears to be closely allied to *P. parasitica* while the other is referred to *Fusarium limonis* [ibid., vi, p. 224]. Recommendations for the control of this disease include the cutting out and disinfection of diseased parts; isolation of diseased trees, and disinfection of the soil around the roots by means of the irrigation water, to which should be added 10 gm. of copper sulphate per hectol. of water at the first, and 20 to 50 gm. at the second watering.

Another form of orange root rot was reported from Gargano. This was only distinguishable from the last by the fact that the rot is confined to the terminal portion of the roots and does not affect the collar and base of the stem. The disease does not appear to have any connexion with a *Phytophthora*, but is thought to be dependent entirely on soil conditions, being prevalent only on heavy and insufficiently drained clay soils.

A new case of the ink disease of chestnuts (*Blepharospora* [*Phytophthora*] *cambivora*) was reported in Castelvittorio (Ventimiglia), and others were found in the neighbourhood of Savona, near which the disease has been known for several years. Attempts are being made to grow the resistant Japanese chestnut (*Castanea crenata*) on Monte Rosso (Pallanza) and also near Rome.

Laurel (*Laurus nobilis*) was attacked by *Corticium luridum*, which caused the development of a brownish-violet layer of fungus tissue on the stems.

Phytophthora syringae was recently observed for the first time in Italy on lilac (*Syringa vulgaris*), probably introduced from Holland [ibid., iv, p. 36]. The similarity of the morphological characters of this species to those described in *P. hibernalis* [ibid., v, p. 296] is noted.

MASLOVSKY (A. D.). Гуртівка по хворобах рослин Харківського краю за травень **1926**. [Report on plant diseases in the Kharkoff region during May, 1926.]—*Бюлетень Харківської Крайової Сільско-Господарьск. Досвідньої Організації* [*Bull. Kharkoff Regional Agric. Exper. Organization*], ii, 6, pp. 26–29, 1926.

This is one of a series of monthly reports appearing in the above-mentioned Bulletin on the diseases of cultivated plants which were noticed in the Kharkoff region during the preceding month. For the most part the diseases recorded in the present issue are of common occurrence. Notes are given on the incidence and severity of attack in each case.

RHIND (D.). **Annual Report of the Mycologist, Burma, for the year ending the 30th June, 1926.**—Rangoon, Supdt., Govt. Printing and Stationery, Burma, 7 pp., 1927.

Rice was attacked by blast (*Piricularia oryzae*), false smut (*Ustilaginoidea virens*), bunt (*Tilletia horrida*), and *Sclerotium oryzae*, none of which caused appreciable damage.

Streak disease of Uba sugar-cane was discovered at Sahmaw in May, 1926, on material from Tatkôn, and subsequent investigation showed that 10·5 and 14·3 per cent. of Uba canes were affected at Tatkôn and Pyinmana, respectively. The markings on the leaves of the Uba canes correspond exactly with those described by Storey from Natal [see also *R.A.M.*, vi, p. 186]. On the native Pyinmana Red variety the markings are less distinct than on Uba, and occasionally mosaic and streak symptoms appear on the same leaf.

Red rot [*Colletotrichum falcatum*] was prevalent at Sahmaw on ratoon canes of the D. 74, B. 376, and Java Hebbal varieties, the two last-named also suffering severely from mosaic.

Smut of sugar-cane [*Ustilago scitaminea*: ibid., iv, p. 259] was again in evidence in various localities, infection amounting to 5·6 per cent. on ratoon D. 74 and often being accompanied by mosaic. Native varieties appear to be less susceptible to smut than foreign ones.

An affection of the renewing bark of rubber in the Moulmein district appears to be due to the drying out of the soft bast after tapping, with consequent destruction of the cambium and wound formation. It is suggested that the direct rays of the sun falling on the young renewing bark may be partially responsible for this disturbance, which could not be traced to the action of fungi.

The Burmese form of brown bast, which was very prevalent, differs somewhat from that occurring elsewhere. It usually starts on the inner edge of the stone cell area and is for some time restricted to that part of the cortex, which becomes brown and dry. Only when the deeper layers of soft bast are penetrated do the trees begin to go dry. Burr formation is also uncommon.

Betel vines [*Piper betle*] covering an area of some 300 acres in the Moulmein district were attacked in January, 1926, by a wilt disease, which is stated to have been progressively increasing in virulence since its first appearance three years ago. Examination of the stem bases and roots showed the presence of numerous bacteria, a sharp black line separating the diseased from the healthy tissues.

The results of seed treatment for the control of root disease of *Sesamum* [*indicum*: *R.A.M.*, v, p. 344] were fairly promising, the average incidence being reduced from 7·1 per cent. in the control plots to 4·6 per cent. in those treated with 0·2 per cent. formalin and to 1 per cent. in those treated with 0·5 per cent. germisan. The formalin treatment gave an increase in the yield of 26·65 per cent., the corresponding figure for the germisan treatment being 14·24 per cent.

Cinchona on the Government Plantation in Tenasserim District was affected by a disease involving a swelling of the stem base with cracking of the bark and shedding of all the lower leaves, sometimes causing the death of the plants.

Groundnuts [*Arachis hypogaea*] suffered from 'tikka' disease (*Cercospora personata*) in Lower Burma [*R.A.M.*, iv, p. 259], and dying-off (*S. rolfsii*) occurred in Upper Burma. Two distinct strains of the latter fungus have been isolated, one producing large dark brown sclerotia and the other smaller, pale ones; both are capable of causing infection.

Cercospora coffeicola and *Colletotrichum coffeanum* [*Glomerella cingulata*] attacked coffee in the Northern Shan States, the latter causing considerable damage to nursery plants in one case.

The mulberry plantations at Maymyo and Mandalay were attacked by mildew (*Phyllactinia corylea*) [loc. cit.], which was controlled by spraying with liver of sulphur wash. Leaves so treated were consumed by silkworms without any ill effects.

Extensive damage was caused to the potato crops by ring disease (*Bacillus* [*Bacterium*] *solanacearum*) [loc. cit.].

A die-back of kapôk [*Eriodendron anfractuosum*], due to *Botryodiplodia theobromae*, and chocolate leaf spot of broad beans (? *Bacillus lathyri*) [*R.A.M.*, ii, p. 97] were recorded for the first time.

RITCHIE (A. H.). **Entomological report, 1925–26.**—*Rept. Dept. Agric. Tanganyika Territory for the twelve months ending 31st March, 1926*, pp. 33–36, 1926. [Received April, 1927.]

In the part of the present report dealing with plant diseases it is stated that besides the three smuts already recorded on sorghum (*Andropogon sorghum*) [*R.A.M.*, v, p. 280], the following have been identified on grasses in the Territory: *Sphacelotheca cruenta* on *Sorghum verticilliflorum*; *S. monilifera* on *Heteropogon contortus*; *Ustilago* sp. on *Hyparrhenia cymbaria*; and *U. flagellata* on *Rottboellia exalta*. Four diseases of bulrush millet (*Pennisetum typhoideum*) have been identified as follows: leaf rust (*Puccinia penniseti*), downy mildew (*Sclerospora graminicola*), smut (*Tolyposporium penicillariae*), and asali disease (*Sphacelia* sp.). The last-named is considered capable of proving a serious disease of millet; the first symptom is a small droplet of pinkish fluid exuding from the gynaecium; the droplets later darken in colour and finally the whole spike agglomerates into a black, sticky mass. A similar disease of millet is stated to have been observed in the Gold Coast, and in Kenya a closely similar disease is reported to occur on sorghum [see also *R.A.M.*, vi, p. 91]. White-grained varieties of sorghum from the Tabora district when grown at the Morogoro Agricultural Station were observed to become of inferior colour, the grains being blotched and speckled with deep red; although a species of *Fusarium* and also one of *Colletotrichum* were found to be occasionally present in such grain, this condition of the grain is believed to be due to a colour variation probably caused by the change of soil and weather conditions.

In resistance tests at the Morogoro Agricultural Station of eleven varieties of sorghum to *Sphacelotheca sorghi* and *S. cruenta*, only the primary heads of one plant of Dwarf Blackhull Kaffir showed evidence of attack; it is pointed out, however, that the season was abnormally dry, and it appears doubtful whether this resistance would be maintained in a season of normal rainfall. In ratoon crops the amount of infection with *S. cruenta* varied from 2·1 to 2·5

per cent. in rows of imported varieties growing in proximity to local sorghums infected with the fungus. These imported varieties were also heavily attacked by *Puccinia purpurea*, which renders practically negligible the possibility of ratooning them.

In a heavy outbreak of maize streak disease [*R.A.M.*, vi, p. 143] the insects *Aphis maidis* and *Peregrinus maidis* were found associated with the disease.

Areolate mildew (*Ramularia areolae*) was recorded on cotton, but the disease has not so far proved of economic importance in the Territory.

Kansas Agricultural Station, Director's Report for the biennium July 1, 1924, to June 30, 1926.—162 pp., 1926. [Received April, 1927.]

In the section of this report dealing with plant diseases (pp. 65–71), the following points are of interest, apart from those already noted in this *Review*.

Dusting wheat with sulphur both in the greenhouse and in the field was found to prevent leaf rust [*Puccinia triticina*] infection, but the frequency and rate of dusting necessary to give satisfactory control were not determined [*R.A.M.*, vi, p. 155].

Natural crosses of wheat and goat grass (*Aegilops cylindrica*) [*Triticum ? cylindricum*], which latter, found in fields of ten counties in Kansas, has become a serious weed in some localities, proved extremely susceptible to *P. triticina* where the parental wheat variety was a susceptible one.

Seed wheat treated with copper carbonate for the control of bunt [*Tilletia levis*] and heavily recontaminated with spores dusted on the seed or applied to the soil was found to become heavily infected with bunt. Copper carbonate treated seed is evidently not necessarily protected against recontamination and undoubtedly the spore load which the seed carries is an important factor in this connexion [ibid., iv, p. 31].

Fairly satisfactory smut [*Ustilago avenae*] control in both hulled and hull-less varieties of oats was secured with uspulun, semesan, kalimat, corona 620, germisan, pythal, seed-o-san, and chlorophol, but they did not prove as reliable as the formaldehyde steep. Furfural gave no smut control in hulled oats and copper stearate failed to control smut in either hulled or hull-less varieties. Dusting with copper carbonate and various forms of sulphur gave excellent smut control in hull-less oats but was ineffective when a hulled variety was used.

Periodic sowings of six varieties of heavily smutted oats were made for two years to determine the effect of soil temperature and moisture on smut infection. The sowings began the first week in March and were continued to the first week in May. Smut infection in all sowings of all varieties was higher in 1925 than in 1924. Soil temperatures of 62° to 66° F. and a soil moisture of about 30 per cent. of the water-holding capacity proved most favourable for infection.

Copper carbonate in various forms and several brands of superfine sulphur gave nearly as good control of sorghum kernel smut [*Sphacelotheca sorghi*: ibid., iv, p. 733] as the formaldehyde

treatment. Copper stearate and colloidal copper failed to give satisfactory control of this disease, but some of the organic mercury compounds were promising [*R.A.M.*, v, p. 728].

The root rot or wilt of lucerne recently described as a bacterial disease [*Aplanobacter insidiosum*: ibid., vi, p. 338] is widespread in Kansas and surrounding States. Affected plants fail to sprout, or if sprouting occurs the growth is weak and spindly. The wood of diseased roots is discoloured, showing a tan or brown and watery appearance when the bark is removed. The stand of lucerne is frequently reduced by 25 to 50 per cent. from this disease in a single season.

The examination of sclerotia taken from potato tubers treated by different methods showed that three minutes in the hot formaldehyde solution in sacks was just as effective for the control of *Rhizoctonia* [*Corticium solani*] as corrosive sublimate for 90 minutes.

Neither sulphur alone nor green manuring alone proved a reliable economic control for potato scab [*Actinomyces scabies*], both having reduced the percentage of scab on potatoes grown on some soils while being ineffective on others. A combination of rye ploughed under for green manure plus 400 lb. of sulphur per acre reduced the infestation from 82·9 to 5 per cent., and the percentage of clean tubers was increased from 11·8 to 62·3.

The symptoms of potato mosaic are masked in Kansas owing to the high temperature during the growing season, but diseased plants, although appearing healthy, showed a greatly reduced yield. Spindle tuber caused a greater reduction in yield in Kansas than all other potato virus diseases.

The cause of a root rot of apple trees which appeared in the north-east of the State was determined as *Stereum purpureum*.

Thirty-ninth Annual Report Georgia Experiment Station for the year 1926.—pp. 119–160, 5 figs., 1 graph, 1926. [Received May, 1927.]

This report contains, *inter alia*, the following items of phytopathological interest (p. 140). An investigation on the nature, cause, and mode of transmission of peach rosette [*R.A.M.*, iii, p. 46] is in progress. Seventy-one seedlings from a badly rosetted tree have made vigorous growth and show no definite symptoms of the disease. Sweet potatoes [*Ipomoea batatas*] may be adequately protected against infection by *Sclerotium rolfsii* by applications of hydrated lime to the bedding soil.

Burger (O. F.). **Report of the Plant Pathologist.**—*Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1926*, pp. 68R–84R, [? 1926. Received April, 1927.]

The present report is compiled very much on the same lines as those of previous years [*R.A.M.*, v, p. 717], and contains, *inter alia*, the following items of interest.

Seedlings of citrus varieties grown in soil inoculated with the citrus canker organism (*Bacterium* [*Pseudomonas*] *citri*) and kept at different temperatures, failed to show any infection as they

pushed through the soil. Young grapefruit seedlings sprouted in test tubes and kept at various temperatures after inoculation with the organism first developed symptoms of the disease when held at 20° C.

The investigation of [Florida] scaly bark of citrus [loc. cit.] was carried on in the year under review both in the field on the east coast and in the laboratory at Gainesville. In the field the first new infections were observed in the first three weeks of June, when also a very few nailhead spots occurred on the fruit. All the new spots on the bark were on wood of the previous year's growth, and no new bark infection was noticed on the current year's growth until the middle of October. Either the disease does not attack fresh shoots or the incubation period is so long that infection is not visible for three or four months. Spots observed in June reached a diameter of 10 to 15 mm. by October and had become reddish-brown in colour and brittle in texture. Isolations from lesions on bark, leaves, and fruit yielded *Colletotrichum gloeosporioides* and *Phomopsis citri* in about 90 per cent. of the plates; in five cases a species of *Cladosporium* was isolated which agreed well with Fawcett's description of the causal organism [*C. herbarum* var. *citricolum*]. Attempts to secure artificial infection of sweet orange seedlings in the field with pure cultures of the *Cladosporium* or with pieces of diseased bark gave negative results. Histological examination of young spots on material killed in 1925 failed to reveal the presence of any organism in the tissues. The parenchyma cells between the phloem and the epidermis were filled with a gum or resin, the gum-filled area extending for about ten cells in advance of apparent infection. The disease appears to be amenable to control by pruning in conjunction with good cultural methods in the groves.

An experimental grove has been started for the investigation of the transmission of citrus blight [loc. cit.] by budding, an inquiry which will probably extend over ten years or more. In addition to the east coast, the disease occurred in the central part of the State on deep sandy soil, on slopes or in groves where the soil had become compacted under the superficial tilled layer. From the evidence collected up to date it is believed that the disease is a physiological disorder caused by extremes in soil moisture conditions; it appears to be caused most frequently by a deficiency of moisture during the dry season of the year, but often also by an excessive amount of moisture in poorly drained soil. It may be intensified by a spell of drought following a water-logged condition and is greatly favoured by neglect of proper cultivation of the groves.

As a result of further study of the bud rot of coco-nuts [loc. cit.] evidence was obtained of the existence of several physiological races or possibly species among the 84 cultures of *Phytophthora* isolated, some being morphologically and culturally identical with *P. faberi* [*P. palmivora*]. Inoculation experiments with two of these strains resulted, in every case, in the production of characteristic lesions, from which the causal organism was subsequently recovered. There appears to be no correlation between temperature and outbreaks of coco-nut diseases, but a very definite correlation was found between the amount of rainfall and the outbreaks.

Report of the Chief of the Bureau of Plant Industry for the fiscal year ended June 30, 1926.—*U.S. Dept. of Agric., Bureau of Plant Industry, Washington, D.C.*, 16 pp., 1926. [Received May, 1927.]

This report contains, *inter alia*, the following items of phytopathological interest. It is estimated that one-tenth of the total 57,000,000 acres of wheat grown in the United States during the current year was sown with seed treated with copper carbonate against bunt [*Tilletia tritici* and *T. levis*]. The net gain from this treatment may be calculated at a minimum of 5,000,000 bushels.

The discovery that heat canker of flax [*R.A.M.*, v, p. 721] can be largely controlled by earlier sowing has resulted in a widespread application of this practice, which is also of value in the production of higher yields.

An annual saving of about 2,000,000 bushels of peaches has been effected by treatment for the prevention of leaf curl [*Taphrina deformans*] and California peach blight [*Coryneum beijerinckii*]. It is further estimated that 12,000,000 bushels of stone fruits are saved annually by the self-boiled lime-sulphur spray, which is particularly valuable in the control of peach scab [*Cladosporium carpophilum*] and brown rot [*Sclerotinia cinerea*].

Some 20,000,000 bushels of saleable apples are saved each year by suitable treatment for the control of bitter rot [*Glomerella cingulata*], blotch [*Phyllosticta solitaria*], and scab [*Venturia inaequalis*], and by the use of oiled wrappers for the prevention of scald.

The methods developed for combating citrus scab [*Sporotrichum citri*] and other diseases are estimated to effect an annual saving of 500,000 boxes of fruit. By improved methods of handling and transport the average annual loss from decay in the orange crop has been reduced from 12 per cent. before 1909 to 2 per cent. at present.

In connexion with the campaign for the eradication of the common barberry [*Berberis vulgaris*], it is stated that a single infected bush has been known to cause a local loss from stem rust [*Puccinia graminis*] of over 10,000 bushels of grain.

As a result of selective methods, the incidence of virus diseases of potatoes has been greatly reduced and the yields augmented by 15 to 30 per cent.

PATEL (M. K.). **Strains of Pseudomonas tumefaciens.**—Abs. in *Phytopath.*, xvii, 1, pp. 46–47, 1927.

Of 15 non-pathogenic strains of *Pseudomonas* [*Bacterium*] *tumefaciens* isolated from 200 three-year-old grafted apple trees, ten were found to resemble the pathogenic strain in morphological characters and physiological reactions. The remaining five reacted like the pathogenic strain, except in some one characteristic. These strains failed to infect tomatoes and castor [*Ricinus communis*], although trials with the pathogenic strain were always successful. The pathogenic strain isolated from soil retained its pathogenicity for ten months; this strain was still virulent after maintenance in culture for two years.

PETRI (L.). **Lo stato attuale di alcune questioni concernenti le ruggini dei cereali.** [The present situation with regard to cereal rusts.]—*Boll. R. Staz. Pat. Veg.*, vi, 4, pp. 265–285, 1926.

The author reviews in this paper, one of a series under the same title [*R.A.M.*, v, p. 723], the literature from 1883 to 1925 dealing with the various factors associated with the resistance of cereals to rusts (*Puccinia* spp.) and briefly indicates the conclusions which may be drawn from the present position of our knowledge of the subject. Resistance of a hereditary and physiological character is termed protoplasmic resistance and is attributed to the impracticability of an exchange of matter between host and parasite and to the antagonistic action of the toxins produced by each. Morphological resistance, due to some special structure of the host, may be influenced by a number of environmental conditions, among which nutrition of the plant and cultural characters have a certain importance. In his opinion the beneficial effect of fertilizers may be attributed more to their influence on the growth and ripening of the plant than to the slight morphological modifications of the infected organs which they produce.

BOLLEY (H. L.) & BRENTZEL (W. E.). **Control of smuts on cereal crops.**—*North Dakota Agric. Exper. Stat. Exten. Circ.* 75, 16 pp., 6 figs., 1927.

The smuts of cereal crops are stated to be steadily gaining ground in North Dakota. Recent data indicate that the loss from bunt of wheat [*Tilletia levis*] in North and South Dakota and Montana amounted to over $8,000,000 in 1925. The life-histories of the smuts are briefly described in popular terms, and directions are given for control by the following methods: (1) copper carbonate dust or formaldehyde solution for bunt; (2) formaldehyde solution for covered smuts of oats [*Ustilago levis*] and barley [*U. hordei*] and smut [*U. crameri*] of millet [*Setaria italica*]; (3) dry formaldehyde [*R.A.M.*, v, p. 414] for covered smut of oats; and (4) hot water [ibid., v, p. 727] for the loose smuts of wheat, oats, and barley [*U. tritici*, *U. avenae*, and *U. nuda*, respectively].

Brief notes are also given on the incidence and control of maize smut [*U. zeae*] and of ergot [*Claviceps purpurea*].

KUHNHOLTZ-LORDAT (G.). **Traitement des céréales par l'acide sulfurique.** [Treatment of cereals with sulphuric acid.]—*Prog. Agric. et Vitic.*, lxxxvii, 6, p. 138, 1927.

Particulars are given in this paper of the method of treatment of cereals with sulphuric acid [against weeds and foot rot due to *Ophiobolus graminis* and *Leptosphaeria herpotrichoides*] in France [*R.A.M.*, vi, pp. 87, 280]. In the Mediterranean region the average strength of solution is given as 10 to 12 l. of sulphuric acid, at 52° R., to 88 to 90 l. of water, and it is applied at the rate of 1,000 to 1,200 l. per hect. when the plants are about 10 cm. high, preferably in dry weather.

SCHANDER, STOLZE, & ROTHMALER. **Beiträge zur Frage der Trockenbeizung und zur Methodik der Untersuchung von Trockenbeizmitteln.** [Contributions to the question of seed treatment with dusts, and to the procedure of testing fungicidal dusts.]—*Pflanzenbau*, iii, 16, pp. 241–260, 10 figs., 1927.

The experiments described in this paper were carried out by the authors to test a number of proprietary seed disinfectant dusts used with cereals for the following qualities, which are stated to be of the utmost practical importance, namely: fungicidal efficiency; adherence to the grains; absence of undue dispersion of the dust in the air during manipulation; and ease in drilling the treated grain.

The fungicidal action of the various compounds was tested in the laboratory on the spores of wheat bunt (*Tilletia tritici*) by Winkelmann's method [*R.A.M.*, vi, p. 281]. In the case of winter injury to rye [*Calonectria graminicola*], stripe disease of barley [*Helminthosporium gramineum*], and loose smut of oats [*Ustilago avenae*], the experiments were conducted under field conditions. Against wheat bunt the best results were obtained with abavit B, 0·2 per cent., porzol H, 0·3 per cent., segetan, 0·4 per cent., agfa 17 c., tutan 490, 0·4 per cent., tr. 125, 0·6 per cent.; against loose smut of oats urania II gave 0·2 per cent. infection, tutan 490, 0·4 per cent., No. 225, 0·3 per cent., No. 175, 0·6 per cent.; against stripe disease of barley, abavit B gave 0·4 per cent., segetan, 0·4 per cent., and urania II, 0·2 per cent.

A detailed description is also given of the methods employed to test the preparations for dispersal of dust during manipulation, their adhesiveness to the grains, and the degree to which they clog the drilling machines, all the experiments being made under laboratory conditions. From the point of view of these properties, the following preparations were deemed to deserve recommendation, although none entirely fulfilled all requirements: abavit B, 0·2 per cent., höchst, 0·2 per cent., tutan rot, 0·2 per cent., No. 225, 0·2 per cent., No. 175, 0·3 and 0·2 per cent., and No. 175 V, 0·3 per cent. It is stated, however, that the three last-named have not yet been sufficiently tested in field practice. The paper also includes the description of seven seed-dusting machines which were tested by the authors. The name and address of the manufacturers is indicated in each case, as also the capacity of the machines, and the cost of the treatment with each of the dusts.

RIEHM (E.). **Lübkes Trockenbeizer 'Puk'.** [Lübke's dusting apparatus, 'Puk'.]—*Deutsche Landw. Presse*, liv, 4, p. 40, 1 fig., 1927.

The construction and use of the 'Puk' seed-grain dusting apparatus [*R.A.M.*, vi, p. 89] are briefly described. The machine consists of a truncated conical container suspended in a metal framework. The opening through which the grain is poured measures 30 cm. in diameter. The lid is fitted with a stuff edge and closes firmly by means of a buckle strap. The container is made to revolve by a double lever, ten to eleven turns being made in one minute and the seed-grain treated for three minutes in all. In a test conducted by the Biologische Reichsanstalt 1 cwt. of wheat was disinfected

with 150 gm. of a dust for the prescribed period. Chemical analyses of three samples of the seed-grain showed adhesion of 93, 93, and 73 per cent., respectively, of the theoretical quantity of dust, these amounts being considered sufficient for the control of bunt [*Tilletia tritici* and *T. levis*]. The 'Puk' apparatus, which costs Mk. 72 and can be managed by one workman, is estimated to treat 10 cwt. of seed-grain per hour.

NIETHAMMER (ANNELIESE). **Ueber die Anwendung des Caporites im Pflanzenschutzdienst.** [On the use of caporit in the service of plant protection.]—*Fortschr. der Landw.*, ii, 3, pp. 81–85, 1927.

The writer describes in detail the results [also presented in tabular form] of her experiments with caporit (a chloride of lime preparation manufactured by Farbenfabriken A.G.) in the control of wheat bunt (*Tilletia tritici*). Used at a concentration of 0·5 gm. per 100 c.c. of water, caporit adequately controlled infection with one hour's immersion. Complete sterilization of wheat seed-grain was effected by two to three hours' immersion in a solution of 8 gm. of caporit per 500 c.c. of water. The chemotherapeutical indices [*R.A.M.*, ii, p. 556], calculated on the percentages of titratable chloride, were 0·5 for complete sterilization and 0·16 for the control of bunt on Postelberg wheat. These fulfil Gassner's requirements. Caporit is stated to be superior to chloride of lime (Merck) [ibid., v, p. 619] both in the quantity and stability of its chloride content.

BIFFEN (R. H.) & ENGLEDOW (F. L.). **Wheat-breeding investigations at the Plant Breeding Institute, Cambridge.**—*Min. of Agric. Res. Monograph* 4, 114 pp., 30 pl., 1926. [Received April, 1927.]

In the chapter of the present monograph dealing with wheat rusts, the authors stress the economic importance of these diseases the whole world over, the aggregate loss from them having been estimated at some £100,000,000 a year. In most of the cereal growing countries devastating outbreaks occur only at intervals, but there exist considerable stretches of territory, especially in Africa, where rust epidemics are so regular as to render wheat growing practically impossible. In England the rusts do comparatively little damage to wheat, although yellow rust [*Puccinia glumarum*], stated to be by far the most common, occurs every season, often in considerable quantity; it is, however, exceptional to find a crop rendered completely worthless by the rust, though this is a very common experience when foreign varieties are grown for trial. The next rust in order of abundance is brown rust [*P. triticina*]; judging from experience with wheat crops in East Anglia, this species becomes more abundant each season, but so far, with the exception of 1924, it has caused relatively little loss, as the first symptoms on the leaves usually occur towards the middle of June, when the plants are almost full grown and the grain is rapidly swelling. Black rust [*P. graminis*] occurs somewhat sparsely every year, but infection never appears to take place sufficiently early to do much damage; there exists historical evidence, however, that in the past this disease has been at times very prevalent, as for

instance, in the early years of the 19th century, when severe outbreaks forced England to import wheat at famine prices; the authors consider that there is no reason for believing such outbreaks to be impossible in the future, but that they are rather to be expected.

A general account is given in popular language of the development of rust-resistant varieties of wheat, for the most part reproducing the information contained in Armstrong's paper [*R.A.M.*, ii, p. 57]. Experiments were made with F_3 and F_4 generations of the cross between Wilhelmina and American Club to test the possibility of breaking down their resistance to yellow rust by manuring successively with soluble nitrogenous fertilizers. The latter were applied in various quantities, the maximum corresponding to a rate of about 8 cwt. of nitrate of soda per acre. Although the season was unfavourable to the rust and but little was found in the fields, all the susceptible strains thus treated were severely attacked, while those raised from resistant F_2 plants remained completely immune with the exception of a few occasional pustules which did not break through the epidermis. It would therefore appear that resistance is not impaired by excessive nitrogenous manuring. Another series of experiments was made to determine whether resistance and susceptibility to brown rust are inherited on the same lines as in the case of yellow rust; the results obtained with the F_5 generation of a cross between a markedly resistant variety collected in Western China and various susceptible forms suggest an identical mode of inheritance of these characters for both species of rusts. It is pointed out that the same Chinese wheat has been used by Backhouse to build resistant forms in the Argentine, where brown rust is very common.

Several attempts were made to breed wheats resistant to mildew (*Erysiphe graminis*) using as the resistant parent a form of *Triticum dicoccum* known as Persian Black [a description of which is given]. Crosses between this and Wilhelmina gave F_1 plants free from mildew in a season, however, when the fungus was not abundant, but as none of the F_2 generation showed any promise of being of economic value further tests were discontinued. More promising results were obtained with crosses of the Persian Black and Rivet wheats, and further work is in progress under glass to test the behaviour of some lines in respect of the mildew.

Although there are indications of varietal differences in the susceptibility of wheat to bunt [*Tilletia tritici* and *T. levis*] no completely resistant form has yet been found. Investigations are also in hand regarding the occurrence of ergot (*Claviceps purpurea*), which has been observed to be comparatively high (up to 10 per cent.) in the F_2 and subsequent generations of Rivet and *T. vulgare* crosses.

JOESSEL (P. H.). **Observations sur les rouilles des Blés dans la région d'Avignon en 1924–1925 et 1925–1926.** [Observations on Wheat rusts in the region of Avignon in 1924–1925 and 1925–1926.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 267–280, 1926.

The author has carried out observations on the seasonal evolution of different wheat rusts in the region of Avignon, and the degree

of intensity of attack on varieties sown in this area [*R.A.M.*, v, pp. 24, 659]. Details are given of the meteorological conditions obtaining in 1924 and 1925, and their influence on the development and spread of *Puccinia glumarum*, *P. triticina*, and *P. graminis* on wheat.

The dominance of *P. glumarum* as compared with *P. triticina* in 1925 is attributed to the very mild and damp weather in the late autumn and early winter, and the consequent high moisture content of the soil. Only a few isolated sori of *P. triticina* were visible in January, and there were no signs of active development until the beginning of May, whereas *P. glumarum* was prevalent continuously from early in January to the middle of May. From the latter date there was a marked decrease in intensity of attack, corresponding with the beginning of the flowering season, for the majority of varieties observed.

In 1926, the development of both species was delayed by the deficiency of soil moisture and the violent winds in the spring. The first pustules of *P. glumarum* were seen at the end of April, and of *P. triticina* at the beginning of May. At the end of the month both species were well established and continued thus until the end of the ripening period.

The damage caused by *P. graminis*, which developed late, was of minor importance in both years.

The observations described above, together with a case cited where *P. glumarum* developed rapidly in midwinter, indicate the minor importance of temperature in infection by this rust under wet conditions.

The varieties of wheat differing in their degree of susceptibility to *P. glumarum* and *P. triticina*, respectively, are listed according to the severity of attack. The early varieties are, in general, the least resistant. This is especially noticeable in the Australian wheats, although in this case the question of acclimatization and the fact that they originated in a region where *P. glumarum* is unknown must not be overlooked. The Australian varieties are apparently most susceptible at the commencement of the flowering period. This was noticeable in the varieties Yandilla King, Waren, Florence, and Federation, which were almost immune from rust during the winter of 1925. Other varieties, such as Carlotta Strampelli, which were badly attacked during that winter, proved to be practically immune at the flowering stage.

The stage of vegetation evidently plays a primary part in the degree of resistance of wheat to rust. It was observed in August, 1925, on two plots cultivated with a variety very liable to shed its grain, that the seedlings coming from the fallen seed were severely attacked by *P. glumarum*. The seeds had obviously germinated in conditions of temperature and of atmospheric and soil humidity very different from those obtaining in winter and early spring.

MAINS (E. B.). **The effect of leaf rust (Puccinia triticina) on the seed production of Wheat.**—Abs. in *Phytopath.*, xvii, 1, p. 40, 1927.

Greenhouse tests made from 1922 to 1925 showed a considerable reduction in the seed developed by wheat plants attacked by leaf

rust (*Puccinia triticina*) as compared with rust-free plants, the reduction depending on the severity of the infection, the infection period, and varietal susceptibility. Little or no seed was produced in susceptible varieties heavily infected from the seedling stage to maturity, and a 15 to 25 per cent. reduction occurred in the case of severe infection from the beginning of heading to maturity. It was found that the upper and lower spikelets in the heads of rusted plants usually failed to develop seed and that the middle spikelets produced fewer seeds due to the failure of the development of their central flowers, such failure being connected with the order in which the flowers blossom and resulting from the insufficiency of material for the development of seed in the later blossoms.

MAYOUE (G. E.). **Barberry eradication in North Dakota.**—*North Dakota Agric. Exper. Stat. Exten. Circ.* 73, 16 pp., 5 figs., 2 maps, 1926. [Received 1927.]

The losses in North Dakota (the leading spring wheat State) from stem rust (*Puccinia graminis*) are stated to be immense. For the ten-year period, 1915 to 1924, the average annual loss of small-grain cereals from stem rust was 19,200,000 bushels (17,800,000 bushels of wheat). Since the initiation of the barberry eradication campaign the losses have been much reduced, those of 1925, for instance, being only one-tenth as heavy as in 1916, although conditions were extremely favourable for the development of infection. The need for the continued prosecution of this campaign is strongly emphasized, and full directions are given for the work of eradication, with notes on various important points in connexion with the life-history of the fungus, its mode of infection, and the like.

KIESSELBACH (T. A.) & PELTIER (G. L.). **The differential reaction of strains within a variety of Wheat to physiological forms of Puccinia graminis tritici.**—*Nebraska Agric. Exper. Stat. Res. Bull.* 39, 15 pp., 1 fig., 1926.

The object of the investigations described in the present paper was to analyse an ordinary commercial mass-variety of wheat from the standpoint of the differential reaction of its component strains to a number of the physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, ii, p. 158]. The variety used in the authors' experiments was Crimean C.I. 1435, an unusually productive mass-variety introduced in 1900 from Russia, and 43 additional varieties and strains were tested for their rust reactions in conjunction with it during two successive seasons.

From plant row tests 578 selections from Crimean C.I. 1435 were made. The reaction of these to the ten physiological forms of *P. graminis tritici* tested show a number of minor variations, but they may be classed in four groups as follows: very susceptible to all the rust forms tested, approximately 110 strains; reactions essentially identical with those of Kanred, namely, highly resistant to forms 6, 14, 21, and 29, and decidedly susceptible to forms 3, 10, 12, 18, 25, and 32, about 237 strains; slightly susceptible to all the forms, 13 strains; and between the first two groups, 218 strains. The first and last groups are thought to offer little promise of successful

selection for rust resistance, but the third is considered to be especially suitable for such work. Most of the 43 other varieties tested were more susceptible than Kanred, but four were about the same as the latter; these were all related to Kanred.

WEBB (R. W.). **Certain factors influencing the development of the mosaic disease in winter Wheat.**—Abs. in *Phytopath.*, xvii, 1, p. 41, 1927.

Experiments with Currell (which shows only the mottling phase of mosaic) [*R.A.M.*, v, p. 85] and Harvest Queen (which exhibits both the mottling and rosette phases) wheats, grown continuously in or transplanted from or to infected soil, showed that (1) the infection period is confined to the seedling stage; (2) seedlings transplanted to infected soil appear most susceptible to rosette when four weeks old; (3) under very favourable environmental conditions an exposure to infested soil of one week from the date of seeding suffices to cause a high percentage of diseased plants; (4) the disease develops only at relatively low constant or low average soil temperature; (5) the development of mosaic is favoured by relatively high constant soil moistures.

CHRISTENSEN (J. J.) & STAKMAN (E. C.). **Susceptibility of Wheat varieties and hybrids to Wheat scab in Minnesota.**—Abs. in *Phytopath.*, xvii, 1, p. 40, 1927.

Over 250 varieties of wheat and numerous selections from crosses, artificially infected with wheat scab [*Gibberella saubinetii*] during the past six years, showed a variation in the amount of seedling blight and head blight in the same variety according to the date of sowing and the temperature and humidity at flowering time. Though susceptible and resistant varieties existed in both groups, durums were more susceptible than common wheats. No varieties were immune. The most susceptible *vulgare* wheats were Marquis (C. I. 3641), Kitchener (C. I. 4800), and Red Bobs (C. I. 6255); Glyndon Fife (Minn. 163), Haynes Bluestem (Minn. 169), and Prelude (C. I. 4323) were resistant; Preston (Minn. 924) was resistant for four years but was heavily infected in 1925. Most of the durum varieties were susceptible, especially Monad (C. I. 3320) and Acme (C. I. 5284), while Arnautka (C. I. 1494) and Mindum (Minn. 470) were somewhat resistant. Most of the hybrids tested were intermediate in their reaction to scab. Some pure lines obtained from crosses between Marquis × Preston and Marquis × Haynes Bluestem were as resistant as the resistant parents, while some lines of the former cross appeared more resistant than either parent.

CARRÉ. **L'amélioration des céréales dans l'Aube.** [The improvement of cereals in the Aube.]—*Comptes rendus Acad. d'Agric. de France*, xiii, 7, pp. 210–214, 1927.

In connexion with the work of selection for the improvement of the cereal crops in the Aube region of France, an account is given of the hybrids 294 A and 299 B (Maison Vilmorin), resulting from crosses between Hybride Verrières and Barbu de Champagne.

These hybrids have been found to show a satisfactory degree of resistance to rust [*Puccinia* spp.] under conditions favourable to the disease.

ZEUSCHNER (M.). **Untersuchungen über die Dicke der Schale verschiedener Weizensorten, ihren Bau und Einfluss auf die Beizempfindlichkeit.** [Tests of the thickness of the husks of various Wheat varieties, their structure, and their influence on susceptibility to injury from steeping.]—*Landw. Jahrb.*, lxiv, 4, pp. 611–645, 8 figs., 1926.

In view of the discovery that the injury resulting in many instances from wheat seed disinfection [against bunt, *Tilletia tritici* and *T. levis*] differed in the different varieties, experiments were conducted at the Friedrich-Wilhelm Institute at Breslau to ascertain the influence exerted by the thickness of the husks on the susceptibility of certain varieties to injury from disinfection. Their thickness was measured and found to vary from 48 to 66 μ. The difference in thickness between the various husks examined was traced to the structure of the pericarp rather than that of the testa. No correlation, however, was found between the actual thickness of the husk and the rate of germination or susceptibility to injury from disinfection by formalin.

BODNÁR (J.), VILLÁNYI (IRENE), & TERÉNYI (A.). **Biochemie der Brandkrankheiten der Getreidearten. I. Mitteilung. Die Kupferadsorption der Weizensteinbrandsporen (Tilletia tritici Bjerk.) aus Kupferverbindungen.** [Biochemistry of the smut diseases of cereals. First communication. The copper adsorption of Wheat bunt spores (*Tilletia tritici* Bjerk.) from copper compounds.]—*Hoppe-Seyler's Zeitschr. für Physiol. Chem.*, clxiii, 1–3, pp. 73–93, 1927.

This paper contains certain data amplifying the results of the authors' previous experiments on the biochemistry of the action of copper compounds on wheat bunt (*Tilletia tritici*) spores [*R.A.M.*, v, p. 153], and also gives full details of the mode and technique of investigation. The average amount of copper adsorbed by the spores during five minutes' immersion in solutions of 0·125 to 2 per cent. copper sulphate was found to be 1·14 per cent. This quantity was somewhat increased after 24 hours' immersion and also by the use of higher concentrations.

Copper chloride and copper nitrate behaved similarly to copper sulphate, but with copper acetate there was a marked increase in the quantity of copper adsorbed, especially after 24 hours' immersion, the amounts being estimated at 2·15 and 4·28 per cent. for the 0·25 and 1 per cent. solutions, respectively.

The adsorbed copper cannot be washed out of the spores with water and only partially with dilute cold n/10 hydrochloric acid, but it is quantitatively soluble with hot 10 per cent. hydrochloric acid.

The bunt spores adsorb only copper from the different copper compounds, the sulphate, chloride, nitrate, and acetate content of the solutions being identical at the beginning and end of the immersion period. In contradistinction to the results obtained by Pichler and Wöber (*Biochem. Zeitschr.*, cxxxii, p. 420, 1922) the

spores of maize smut [*Ustilago zeae*] were also found not to adsorb the sulphate from a copper sulphate solution.

The copper adsorbed by the bunt spores is not replaced by amines, as stated by Volkart (*Landw. Jahrb. der Schweiz*, xx, p. 443, 1906), but at first by the metal components diffused by the spores (alkalis, calcium, and magnesium) and later, to a very slight extent, by hydrogen-ions. The adsorbed copper combines partially with phosphoric acid and in part with the albuminous substances. The adsorption of copper by bunt spores is primarily a chemical phenomenon.

TISDALE (W. H.) & GRIFFITHS (MARION A.). **Strains of Ustilago nuda and certain host relationships.**—Abs. in *Phytopath.*, xvii, 1, p. 42, 1927.

Loose smut (*Ustilago nuda*) collected from Tennessee Winter barley contained two strains of the fungus. Spores from this collection smutted the varieties Han River and Alaska. Spores from Han River gave 100 per cent. infection on Hannchen, while spores from Alaska, which produced 100 per cent. smut in Orel, did not infect Hannchen, even though the fungus was grown in other varieties before Hannchen was inoculated. Spores from Hannchen which came through Han River from Tennessee Winter caused 60 per cent. infection on Alaska. Of thirty-two collections of smut from various sources, twenty-six produced smut in Tennessee Winter and only nine in Hannchen.

JOHNSTON (C. O.). **Effects of soil moisture and temperature and of dehulling on the infection of Oats by loose and covered smuts.**—*Phytopath.*, xvii, 1, pp. 31–36, 1927.

Weekly sowings of six varieties of oats (Hull-less, Ks. 5201, very susceptible; Aurora, Ks. 5206, susceptible; Richland, Ks. 5209, moderately susceptible; Burt, Ks. 6004, moderately susceptible; Burt, Ks. 6090, resistant; Kanota, Ks. 5179, resistant) made during the seasons of 1924 and 1925, indicate that low smut (*Ustilago avenae* and *U. levis*) infection occurs in very early and very late sowings, while high smut infection seems to be contingent on high temperature and low moisture content of the soil. Little infection occurred when the soil temperature was below 38° F., soil temperatures of 62° to 66° being apparently the most favourable for infection. The highest infections were obtained when the soil moisture was below 30 per cent. of the water-holding capacity of the soil.

In both seasons removal of the glumes caused a large increase in the percentage of smut infection in inoculated seed. This increase was largest in susceptible and moderately susceptible varieties and smallest in resistant varieties. The results indicate that some varieties of oats, e.g., Burt, Ks. 6090, are resistant to smut partly on account of the protection given by the glumes; others, like Kanota, Ks. 5179, in addition to this, have a larger amount of inherited protoplasmic resistance. Even with dehulled seed and heavy inoculation it was not found possible to get 100 per cent. infection in the author's tests. It is suggested that this is due to resistant individual plants in the hulled varieties used.

SEIFFERT (J.). **Künstliche Blüteninfektionen zur Untersuchung der Empfänglichkeit verschiedener Gerstensorten für Ustilago hordei nuda unter Einfluss äusserer Bedingungen auf die Höhe des Brandprozentes.** [Artificial blossom inoculations for the investigation of the susceptibility of different Barley varieties to *Ustilago hordei nuda* in connexion with the influence of external conditions on the incidence of smut.] —*Kühn-Arch.*, xii, 1926. [Abs. in *Fortschr. der Landw.*, ii, 1, p. 32, 1927.]

Attention is drawn to the difficulties of inoculating barley with loose smut (*Ustilago hordei nuda*) [*U. nuda*] and of estimating the percentage of infection. For the latter purpose the mathematical formulae of alternative or serial variation are useful. It has been found impossible to gauge the effect of the date of sowing on the incidence of loose smut. Shallow sowing appears to minimize the tendency to infection. Some of the hull-less varieties showed a certain degree of resistance.

STRAŇÁK (F.). **O přičině letošní pohromy na Žitech.** [Causes of this year's failure of the Rye crops.]—*Ochrana Rostlin*, vi, 5–6, pp. 105–113, 4 figs., 1926.

During the early winter of 1926–7 the autumn-sown rye crops in Czecho-Slovakia, especially those on higher ground in the north-east, south-east, and central provinces, were reported to be greatly delayed and reduced in their germination; in numerous cases the stands are stated to have been diminished by 50 per cent., but some growers report as high a loss as 80 to 90 per cent. of their seedlings. Field investigations and isolations from the diseased seedlings showed that the condition was caused by one or several undetermined species of *Fusarium*, which the author believes may be amongst those described by Appel [*R.A.M.*, iv, p. 161] as responsible for losses due to reduced germination and the infection of very young seedlings. It is pointed out that the summer of 1926 in Czecho-Slovakia offered very favourable conditions for the attack and development on rye of species of *Fusarium*, and that almost the whole of the resulting seed was highly contaminated. This is substantiated by the observation that the losses were particularly severe on those farms where the seed was not disinfected before sowing, or where the disinfectant used was not appropriate. Disinfection experiments carried out by the author once again confirmed the efficacy of mercuric compounds, especially of uspulun and abavit. Of interest also was the observation that local varieties of rye, or importations which had been cultivated locally for a number of years, showed a higher degree of resistance than new selections. All crosses with Petkus ryes proved to be very susceptible.

GRIFFITHS (MARION A.). **Smut resistance in Corn.**—Abs. in *Phytopath.*, xvii, 1, p. 42, 1927.

Strains of maize highly resistant to smut [*Ustilago zeae*] under field conditions proved very susceptible to infection when conidial suspensions were injected into meristematic and very young, rapidly growing tissue. Pouring the inoculum into the top of the plant

resulted in a relatively low percentage of infection as compared with the high percentage obtained by injection into the apical bud. Similar results were obtained under field and greenhouse conditions.

HURD-KARRER (ANNIE M.) & HASSELBRING (H.). **Effect of smut (Ustilago zeae) on the sugar content of Cornstalks.**—*Journ. Agric. Res.*, xxxiv, 2, pp. 191–195, 1927.

Comparative determinations were made of the sugar content of normal maize plants and of those affected with smut (*Ustilago zeae*). Samples of stem internodes were taken from heavily infected, moderately infected, and slightly infected plants, each sample being paired with a corresponding one from a neighbouring healthy plant. Tabulated results of the sugar determinations show that there was a considerable reduction of sucrose and a lesser reduction of hexoses in the diseased stalks, the loss being greatest in the most severely infected plants. The writers point out that this result is in accordance with the views of earlier writers that other obligate parasites are dependent on the carbohydrate supply of the host plant, and follows naturally from the observation that the specific gravity of the juice from maize stalks infected with smut is lower than that of the juice from sound stalks [*R.A.M.*, v, p. 745]. The data here given do not permit of any definite conclusions as to the form in which the carbohydrates are absorbed by the fungus. The utilization of intermediate products which occur in the process of carbohydrate formation would seem to be excluded, since the fungus can invade the young grain, in which primary synthesis of carbohydrates is not thought to take place, and it is suggested that the fungus may use either the sucrose or the hexoses primarily, thereby hindering the formation of sucrose or causing its inversion.

PLATZ (G. A.), DURRELL (L. W.), & HOWE (MARY F.). **Effect of carbon dioxide upon the germination of chlamydospores of Ustilago zeae (Beckm.) Ung.**—*Journ. Agric. Res.*, xxxiv, 2, pp. 137–147, 3 figs., 1927.

The present paper describes work undertaken to determine more accurately than has hitherto been done the stimulatory [*R.A.M.*, iv, p. 304] or inhibitory [ibid., ii, p. 25] effect of carbon dioxide on the germination of fungus spores. The effect of the presence of any one of twenty kinds of living plant tissue on the germination of chlamydospores of *Ustilago zeae* was very marked. The percentage of germination after 24 hours in these cases varied from 56·5 to 86·5, as compared with 43·1 in the control experiments with no plant tissue present. The former cultures also germinated several hours earlier and produced a greater abundance of sporidia than the controls. That carbon dioxide, given off by the plant tissue, provided the stimulus to germination was proved by experiments in which chlamydospores of *U. zeae* were germinated in moist chambers containing (1) no plant tissue; (2) a known weight of crushed plant tissue; (3) barium hydroxide, as well as the same weight of plant tissue; and (4) air which had been passed over plant tissue, and

through barium hydroxide. Stimulation occurred in the second case, but in the last two cases the percentage of germination was comparable to that in the control. Determinations of the carbon dioxide given off by the plant tissue showed that atmospheres of 10 to 15 per cent. carbon dioxide occurred in the culture chambers.

Experimental proof was obtained that the hydrogen-ion concentration of tap water especially, and to a less extent of agar and gelatine media, is considerably altered by exposures to atmospheres in which plant tissue is present, or to which 5 to 30 per cent. of carbon dioxide has been added.

By germinating chlamydospores in atmospheres containing carbon dioxide in proportions varying from 5 to 75 per cent. it was found that the optimum germination occurred at a concentration of 15 per cent. carbon dioxide in tap water or on 3 per cent. agar, 10 per cent. gelatin, silica jelly, or collodion film. Above 15 per cent. the amount of germination was found to be retarded. The hydrogen-ion concentrations in the culture media when the atmosphere contained 15 per cent. of carbon dioxide were found to change from P_H 6·5 or 6·7 to values varying from 4·9 to 5·6. The optimum acidity for germination appeared to be about P_H 4·9.

The excellent germination obtained on silica jelly and collodion, where no nutrient substances were present, indicates that germination is dependent on temperature, moisture, carbon dioxide, and oxygen, rather than on the presence of a nutrient substratum.

ORTON (C. R.). **The permeability of the seed coat of Corn to mercury compounds.**—Abs. in *Phytopath.*, xvii, 1, p. 51, 1927.

Tests on the permeability of four sweet and three dent varieties of maize showed that the portion of the seed coat covering the embryo side of the seed was more slowly permeable than that covering the endosperm, and that the rate of permeability to each of the four mercury compounds employed varied with the maize varieties. Mercuric chloride (1 to 1,666) and cyan-cresol mercury (1 to 400) passed through in about 30 minutes or less, nitro-phenol-mercury sulphate (1 to 400) in an average of about 60 minutes, and chlor-phenol-mercury sulphate (uspulun) (1 to 400) in an average of 80 to 145 minutes.

MELCHERS (L. E.) & JOHNSTON (C. O.). **Sulphur and copper carbonate dusts as effective fungicides for the control of Sorghum kernel smut and Millet smut.**—Abs. in *Phytopath.*, xvii, 1, p. 52, 1927.

Experiments at the Kansas Station proved the effectiveness of copper carbonate for sorghum kernel smut [*Sphacelotheca sorghi*] control, and the treatment is now widely practised in Kansas and is being introduced into other States. It is also the most efficient and practicable control for millet [*Setaria italica*] smut [*Ustilago crameri*]. Similar applications were given as for wheat bunt [*Tilletia levis*], but preference was given to the 50 to 55 per cent. grades of copper carbonate.

Sorghum kernel smut was equally well controlled with flowers of sulphur and the more reduced sulphur dusts, such as sulfodust

and kolodust, the cost of treatment being about one-sixth of 1 cent. per acre. Millet smut was not satisfactorily controlled with sulphur dusts.

MELHUS (I. E.), VAN HALTERN (F.), & BLISS (D. E.). **A study of the downy mildew, Sclerospora graminicola (Sacc.) Schroet.** —Abs. in *Phytopath.*, xvii, 1, p. 57, 1927.

The authors state that turgid leaves covered with a film of moisture, and a temperature between 10° and 27° C., seem to favour sporulation in *Sclerospora graminicola* on *Setaria viridis* [*R.A.M.*, v, p. 224]. Light apparently is not a factor of importance. They state that the fungus hibernates by means of oospores rather than by intraseminal mycelium, that the oospores require no rest period and, in dry conditions, remain viable at least seventeen months, and that infection, which generally is systemic, may take place near the base of the plumule twenty-four hours after the latter emerges from the seed coat. On maize, 11 per cent. infection resulted from sporangia and 91 per cent. from oospores. The oospores were not killed after soaking for ten minutes in a 2 per cent. copper sulphate solution, nor when heated to 50° C. for one hour. Five minutes in 1 per cent. formaldehyde inhibited oospore germination, while 1 in 1,000 mercuric chloride for forty minutes at room temperature did not.

FULTON (H. R.) & BOWMAN (J. J.). **The effect of spraying with fungicides on the keeping quality of Florida Citrus fruits.**— Abs. in *Phytopath.*, xvii, 1, p. 47, 1927.

Single applications made on 15th April and 5th May of 3-3-50 Bordeaux mixture plus 1 per cent. oil emulsion reduced by more than one-half the subsequent development in a prolonged marketing period of the stem-end rot caused by *Phomopsis citri* (*Diaporthe citri* Wolf) and by about one-fifth that caused by *Diplodia natalensis*, from both of which Florida citrus fruits suffer losses. The blue mould rots, *Penicillium digitatum* and *P. italicum*, were not materially affected. The authors state that two spray applications in the spring control rot slightly better in the marketed fruit than one application, owing mainly to increased effectiveness against the *Diplodia* rot, and that midsummer and autumn applications are relatively ineffective. The oil emulsion must be used alone a few weeks later to check the increase of scale insects following the destructive action of the copper fungicide on the entomogenous fungi which keep these pests in check.

TEODORO (N. G.) & GOMEZ (E. T.). **Coffee diseases and their control.**—*Philipp. Agric. Rev.*, xix, 3, pp. 249-257, 1926. [Received 1927.]

The purpose of the present paper is to supply local coffee growers (in view of the fact that of late years many coffee plantations have been restarted in the Philippine Islands) with brief popular descriptions of the most dangerous diseases to which the crop is subject in all countries where it is cultivated, and of the control measures

recommended. Root diseases include brown root rot caused by *Fomes lamaoensis* [*R.A.M.*, v, p. 299]; *Armillaria mellea* [loc. cit.]; root mealy bug disease (*Polyporus coffeae* in association with *Pseudococcus citri*) [loc. cit.]; black and white root rot caused by species of *Rosellinia* [ibid., v, p. 736]. Stem diseases include die-back [ibid., v, p. 299]; pink disease caused by *Corticium salmonicolor* [loc. cit.]. Leaf diseases include rust caused by *Hemileia vestatrix* [loc. cit.]; brown eye spot caused by *Cercospora coffeicola* [ibid., v, p. 737]; koleroga leaf spot caused by *Corticium koleroga* [ibid., vi, p. 148]; leaf spot caused by *Stilbella* [*Omphalia*] *flavida* [ibid., v, p. 736]; other leaf spots caused by *Mycosphaerella coffeicola* and *Micropeltis musae*; brown blight caused by *Colletotrichum coffeanum* [*Glomerella cingulata*: ibid., vi, pp. 78, 93]; cobweb disease caused by a sterile mycelium. Berry diseases include berry blotch caused by *Cercospora coffeicola*, and berry blight caused by *Colletotrichum coffeanum*. Damping-off of seedlings caused by various fungi such as *Rhizoctonia* and *Sclerotium*, and miscellaneous troubles including witches' brooms, and sooty mould caused by *Capnodium brasiliense* [ibid., v, p. 298] are also mentioned.

NICAUD (P.). **Les mycoses pulmonaires.** [Pulmonary mycoses.] —*Presse Méd.*, xxxiv, 97, pp. 1521–1524, 7 figs., 1926. [Abs. in *Trop. Dis. Bull.*, xxiv, 4, pp. 318–319, 1927.]

Pneumomycoses [the clinical features of which are briefly outlined] are generally ascribed to secondary infection, but Macaigne and Nicaud have observed a case of primary infection caused by an *Aspergillus*. The principal pneumomycoses are stated to be: *Mucor* mycoses, which are rare and generally secondary infections; aspergilloses, chiefly associated with *A. fumigatus*, which may take the form of a secondary infection accompanying tuberculosis, or of a primary, fatal infection [*R.A.M.*, vi, p. 95]; oosporoses, which are commonly represented by actinomycosis, and occur as primary infections or as secondary infections of tuberculous or other lesions; and the rare sporotrichosis caused by *Sporotrichum beurmanni*, which generally follows cutaneous infection [ibid., i, p. 352].

BERDE (K. v.). **Ueber die pathogene Fadenpilzflora in Südungarn.** [On the pathogenic hyphomycetous flora of south Hungary.]—*Arch. für Dermatologie*, clii, 1, pp. 126–131, 1 graph, 1926.

Dermatomycoses in the south of Hungary were found to be caused primarily by *Microsporon audouini* [*R.A.M.*, v, p. 553], which occurred in 102 out of the 300 cases examined by the writer at Szeged. *Achorion schönleini* and *M. minutissimum* were found in 41 and 39 cases, respectively, while *Trichophyton violaceum*, *T. gypseum asteroides*, *T. faviforme ochraceum*, and *Epidermophyton inguinale* occurred 25, 12, 17, and 14 times. Some interesting observations are made on the prevalence of the various types of dermatomycosis in persons of different ages. During the first half of 1924 fungous diseases constituted 12·7 per cent. of the

total number of skin diseases examined, while in the corresponding period of 1926 the proportion was only 5·5 per cent.

CASTELLANI (A.). **Tonsillomycosis.**—*New Orleans Med. and Surg. Journ.*, lxxviii, 10, pp. 651–661, 5 figs., 1926. [Abs. in *Trop. Dis. Bull.*, xxiv, 4, pp. 319–320, 1927.]

Chronic tonsillomycosis is stated to be generally due to infection by Microsiphonales, *Nocardia* [*Actinomyces*] and *Cohnistreptothrix* being rarely implicated and usually affecting only one tonsil, which is much enlarged and contains one or more small abscesses. *Leptothrix* and *Vibriothrix*-like organisms occur in profusion in the granules of the pus, which appear as whitish spots on the tonsils in the little-known condition of granular mycosis of the crypts.

Acute and subacute tonsillomycoses, associated with *Monilia* [? *Candida*], *Saccharomyces*, *Cryptococcus*, *Oidium* [*Oospora*], *Willia*, and *Hemispora*, are relatively common. The last-named organism differs somewhat from the others mentioned in the production of greyish instead of creamy patches, and in its more persistent symptoms.

BARDELLI (P.) & ADEMOLLO (A.). **Sulla resistenza delle colture di 'Criptococcus farcinimosus' Rivolta agli agenti fisici e chimici.** [On the resistance of cultures of *Cryptococcus farcinimosus* Rivolta to physical and chemical agents.]—*Ann. d'Igiène*, xxxvii, 2, pp. 81–85, 1927.

In November, 1926, the writers tested the resistance of the causal organism of epizootic lymphangitis of the horse (*Cryptococcus farcinimosus*) to various physical and chemical agents. After natural desiccation for 25 months in the laboratory the fungus was viable and produced the typical symptoms of the disease on inoculation. Fragments of cultures exposed to desiccation over calcium chloride or sulphuric acid lost their virulence in four days or 32 hours, respectively. Exposure to temperatures of 65° to 67°, 80°, and 98° to 100° C. killed the cultures in 90, 20, and 7 minutes, respectively.

Of the chemical agents tested, miscela Laplace (5 per cent.) destroyed the virulence of the cultures in 3 minutes; 5 per cent. carbolic acid, 3 per cent. seifformol (a saponaceous solution of formalin containing 3·5 per cent. formaldehyde), 5 per cent. crude seifformol, and 5 per cent. seiffenol (a saponaceous solution of impure phenol) were toxic in 10 minutes; 5 per cent. iodized water and 50 per cent. oxygenated water in 1 and 2 hours, respectively; while 4 per cent. boric acid was ineffectual.

CATANEI (A.), GROSDEMANGE (L.), & LEGROUX (C.). **Sur un cas de mycétome du pied observé en Algérie.** [A case of mycetoma of the foot in Algeria].—*Bull. Soc. Path. Exot.*, xx, 1, pp. 11–13, 1927.

Microscopic examination of the lesions in a case of Madura foot in Algeria revealed the presence of *Nocardia* [*Actinomyces*] *madurae* in various stages of development. An artificial culture of this parasite, stated to be that most frequently met with in this disease in Northern Africa, was obtained.

BOLOGNESI (G.) & CHIURCO (G. A.). **Sopro una nuova micosi del torace ('Malbranchea bolognesii-chiurcoi' Vuillemin, Pollacci, et Nannizzi).** [On a new mycosis of the thorax (*Malbranchea bolognesii-chiurcoi* Vuillemin, Pollacci, & Nannizzi).] —*Arch. di Biol.*, i, 24 pp., 1925. [Abs. in *Bull. Inst. Pasteur*, xxv, 3, pp. 129–130, 1927.]

Cultures from scrapings of a mycetoma of the thorax in a twelve-year-old boy yielded a species of *Malbranchea* diagnosed as new by Vuillemin, Pollacci, and Nannizzi, and given the name of *M. bolognesii-chiurcoi*. Inoculation experiments on white rats gave positive results in the form of numerous abdominal and cutaneous swellings.

FILHO (P.). **Macroglossia mycotica.**—*Journ. Trop. Med. & Hygiene*, xxx, 1, pp. 8–10, 2 figs., 1927.

A case of 'macroglossia mycotica' in an Italian, aged 53, is reported from Porto Alegre, Brazil. The patient noticed a slight hypertrophy of the tongue, accompanied by the development of small, white spots on the dorsum, twelve years ago, but no further ill effects were experienced. In January, 1926, the writer found long, septate, mycelial hyphae, together with Gram-positive cocci and bacilli in the lesions. Cultures on Sabouraud's glucose agar, kept at 37° C., developed smooth, glistening, white colonies of a species of *Monilia* [? *Candida*] in 48 hours. The round or oval cells were generally grouped in pairs, and small chains of oval cells were also observed. Globular, Gram-positive yeast cells developed on Gram-Nicolle medium, and a small amount of mycelium was seen in preparations made from the condensation water of Sabouraud's medium.

The cultural characters of the organism, to which the name of *Monilia aldoi* is given, are briefly described, and its position in Castellani's third or *Pinoyi* group [Castellani & Chalmers, *Manual of Tropical Medicine*, p. 1081, 1919] is concisely indicated.

ROBIN (V.), LESBOUYRIÈS (G.), & VECHIN (A.). **Sur une péritonite mycosique de carnivores.** [On a mycotic peritonitis of carnivora.]—*Bull. Soc. Centr. Méd. Vétér.*, cii, pp. 332–336, 1926. [Abs. in *Bull. Inst. Pasteur*, xxv, 3, p. 132, 1927.]

Peritoneal exudations of a dog and cat contained white, mammillary, granular elements, resembling grains of semolina, and formed by the hyphae of a slightly Gram-positive, non-acid-resistant actinomycete, which proved very difficult to cultivate. Inoculation experiments gave positive results on rabbits and dogs, but not on guinea-pigs. The disease appears to develop very slowly under natural conditions. This is stated to be the fourth record of actinomycosis among the carnivora.

MATTLET (G.). **Mycoses dans l'Urundi.** [Mycoses in the Urundi region.] *Ann. Soc. Belge Méd. Trop.*, vi, 1, pp. 1–41, 19 figs., 1926. [Abs. in *Trop. Dis. Bull.*, xxiv, 4, p. 318, 1927.]

Fungi of the genera *Torula, Cryptococcus, Blastodendrion, Mycoderma,* and *Sterigmatocystis* [*Aspergillus*] were isolated from the sputum of patients suffering from bronchial affections. In some cases *Blastodendrion* persisted in the sputum after improvement in

the general condition resulting from treatment with potassium iodide and cacodylate of soda or novarsenobenzol. Species of *Monilia* [? *Candida*] and *Blastodendrion*, associated with bacteria, were involved in the causation of 'kafindofindo', a condition affecting the base of the tongue and the neck, and sometimes producing acute pain and intense fever.

Species of *Willia* (including *W. bispora*), *Monilia, Mycoderma, Blastodendrion*, and *Cryptococcus* were shown to be present in patients exhibiting symptoms of true dysentery [notes on the treatment of which are given]. A species of *Cryptococcus* was associated with ulceration of the jaw.

The morphological, cultural, and biochemical characters of the organisms are described.

WATSON (J. R.) & BERGER (E. W.). **Citrus insects and their control.**—*Florida Agric. Exper. Stat. Bull.* 183, 133 pp., 87 figs., 1926. [Received April, 1927.]

In the present bulletin, chiefly designed to give information on the various insect pests of citrus trees and their control in Florida, notes are given by Berger on the entomogenous fungi parasitizing the insects, including the red-headed scale fungus (*Sphaerostilbe aurantiicola*), white-headed scale fungus (*Podonectria coccicola*), black scale fungus (*Myriangium duriaei*), pink scale fungus (*Nectria diploa*), cinnamon fungus (*Verticillium heterocladum*) [*R.A.M.*, vi, p. 255], *Aschersonia cubensis*, turbinate fungus (*A. turbinata*), and *Cephalosporium lecanii*, all of which are stated to be very efficient in the natural control of coccids; *Entomophthora fumosa* on mealy-bugs (*Pseudococcus citri*); a species of *Cladosporium* on the woolly whitefly (*Aleurothrixus howardi*); *Aschersonia aleyrodis, A. goldiana, Aegerita webberi, Fusarium aleyrodis*, and *V. heterocladum* on species of aphids. Notes are also given on the use of these fungi for the artificial control of the pests. The best results are said to have been obtained during the period of summer rains. The fungi do not thrive in groves that are out of condition or on trees newly planted, and spraying is advised in these cases. Applications of fungus spores, obtained from cultures, will produce visible results in three to six (generally in about four) weeks.

HARTLEY (C.). **Notes on Hibiscus diseases in West Java.**—*Phytopath.*, xvii, 1, pp. 25–27, 1927.

In a series of investigations conducted in 1921 and 1922, Java jute (*Hibiscus cannabinus*) was found to be very subject to slime disease (*Bacterium solanacearum*) at Buitenzorg [*R.A.M.*, ii, p. 314; vi, p. 390]. *Sclerotium rolfsii* produced dry, zonate, reddish-brown and pale greyish-brown lesions on the stems of plants stunted by drought. In severe cases the plants were generally weakened and ultimately wilted.

Grey, water-soaked lesions on young plants of *H. cannabinus* developed, under moist conditions, an abundance of deep salmon pustules of hyaline spores measuring 13·5 by 4·5 μ. The fungus was identified by Van Luijk as *Colletotrichum hibisci* Pollacci.

A green-stemmed strain of roselle (*H. sabdariffa altissima*) at Buitenzorg was found to be suffering from a leaf disease closely

resembling that reported from Sumatra as due to a species of *Phyllosticta* [*R.A.M.*, iv, p. 739]. Infection originated at the union of petiole and leaf-blade, and extended along the veins, often partially or wholly destroying the leaf. Pycnidia developed in large numbers, but the spores failed to mature either in nature or in pure culture, and the fungus was not identified. Inoculation experiments gave positive results on both green- and red-stemmed strains of *H. sabdariffa altissima*, the typical sterile pycnidia promptly developing on the lesions.

KLETSCHETOFF (A. N.). Повреждение Льна при бессменных посевах грибом **Thielavia basicola Zopf.** [Injury to Flax caused by *Thielavia basicola* Zopf when the crop is grown uninterruptedly on the same soil.]—*Научно-Агроном. Журнал.* [*Journ. of Scient. Agron.*] [? *1926*], 12, pp. 823–834. [? 1926. German summary.]

In continuation of the author's investigation of the causes of 'flax-sickness' of the soil [*R.A.M.*, v, p. 100], experiments were made in the period 1923 to 1926 at the Flax Experimental Station and in the experimental fields of the Agricultural Academy of Moscow (where flax has been cultivated uninterruptedly on the same soil since 1915 and 1912, respectively). These indicated that weeds are not responsible for this condition, since careful weeding of the experimental plots did not reduce to any appreciable degree the number of flax seedlings that perished on them, irrespective of whether the plots had or had not received applications of mineral fertilizers or of stable manure. This finding was further confirmed by numerous field observations.

Typical symptoms of 'flax-sickness' were obtained when sterilized soil was inoculated with *Fusarium lini*, *Colletotrichum lini*, *Polyspora lini*, and *Thielavia basicola*. Of these fungi, the last-named only is discussed in detail in the present paper, as it is pointed out that so far it has been found attacking flax only in Ireland and in Russia. Its pathogenicity to young seedlings of flax was established by the author's experiments, in which 100 per cent. of the seedlings were infected by the fungus four weeks after sowing in artificially contaminated soil. Comparative experiments, in which flax was sown in flax-sick soil and in soil taken from fields subjected to crop rotation of various duration, showed that while in the latter all the seedlings invariably come up healthy, in the former 37 to 60 per cent., and 85 to 100 per cent., respectively, of the seedlings in two experiments were attacked and bore the chlamydospores of *T. basicola* on their roots. The infection occurred irrespective of the season at which the soil was taken from the flax-sick fields or at which the flax was sown. The author considers that the organism is not a biological strain of *T. basicola*, but is the form described by Zopf, since he succeeded in infecting with it *Viola odorata*, *V. tricolor*, *Trifolium pratense*, and *Lupinus luteus*.

KLETSCHETOFF (A. N.). Болезни семян Льна и опыт протравливания посевного материала. [Seed-borne diseases of Flax, and an experiment in seed disinfection.]—Reprinted from *Вестник Льн. Дела* [*Flax Industry News*], iv, 6 pp., 1926.

The author describes the adverse conditions with which flax

cultivation has to contend in the central provinces of Russia, chiefly owing to the fact that almost the whole of the available seed is highly contaminated with various fungous diseases. Examples are cited of localities in which the losses to the crop due to these diseases amount to 85 per cent. and over, the chief damage being done to the fibre. The most common seed-borne diseases [brief descriptions of which are given] include seedling blight caused by *Colletotrichum lini*; brown spotting and breaking of the stems caused by *Polyspora lini*; wilt, *Fusarium lini*; and rust, *Melampsora lini*. Although seed disinfection has been practised for some time abroad, it is still unknown in Russia, and the author briefly describes his preliminary experiments in this direction. Promising results were obtained in the laboratory, both from the point of view of the germinability of the treated seed and of the resulting infection of the seedlings, with the following steeps: 3 per cent. solution of formalin in alcohol, plus 1 per cent. naphthalene; 0·1 per cent. solution of mercuric chloride in alcohol; ether; and 65° and 96° alcohol; and with the following dusts: dehydrated copper sulphate, copper carbonate, chloride of lime, potassium chloride, wood ash, unslaked lime, and soda, used either singly or in various combinations.

PAPE (H.). **Fehlschläge beim Frühtreiben von Maiblumen.** [Failures in forcing Lilies-of-the-Valley.]—*Gartenwelt*, xxxi, 5, pp. 70–71, 1 fig., 1927.

During the period from November, 1926, to January, 1927, a number of failures among forced lilies-of-the-valley [*Convallaria majalis*] were reported in Germany. The affected seedlings were more or less atrophied and the few shoots and leaves which developed soon wilted. The roots of the diseased plants showed a brown or black discoloration, frequently penetrating to the vascular bundles, and in advanced stages the internal tissues of the rootstock were attacked by a white rot. Innumerable rod-shaped bacteria were visible under the microscope in the slimy, decaying, malodorous tissues, but they were apparently not the primary cause of the rot as they were not found in its earliest stages, were not invariably present, and failed to infect healthy roots. The rot is attributed to unfavourable climatic conditions, especially to the heavy rainfall of 1926, which retarded the maturity of the plants on heavy, impermeable soils. After a wet summer, seedlings for forcing should be taken only from loose, sandy soils. The excessive use of nitrogenous fertilizers should be avoided, and great care must be taken to maintain favourable conditions in the frames.

PASSALACQUA (T.). **Vaiolatura fogliare dell' Ortensia prodotta da una Phyllosticta.** [Leaf spotting of Hydrangea produced by a *Phyllosticta*.]—*Curiamo le piante!*, i, pp. 5–7, 1 pl., 1926. [Abs. in *Riv. Pat. Veg.*, xvii, 3–4, pp. 77, 1927.]

On a florist's premises at Turin the leaves of hydrangea plants were badly damaged by a *Phyllosticta* resembling *P. hydrangeae* Ellis and Everhart, except that the spores measured 3 to 4 by 1·5 μ as compared with 10 to 12 by 2·5 to 3·5 μ in the American species.

The author regards this as a distinct variety, to which the name *P. hydrangeae* var. *europaea* is given.

BROWN (NELLIE A.). **Sweet Pea fasciation, a form of crowngall.**—*Phytopath.*, xvii, 1, pp. 29–30, 2 pl., 1927.

Fasciation of sweet peas [*Lathyrus odoratus*] has been reported from greenhouses in New Jersey and New York State, and from gardens in Maryland and Virginia. The main upright stem produces at the crown a bunch of short, fleshy, or wide stems, which give rise to misshapen and aborted leaves. The crown gall organism (*Bacterium tumefaciens*) was isolated from infected material [see also *R.A.M.*, ii, p. 10] and inoculated into eleven healthy seedlings of the variety on which the disease has occurred in New Jersey for several years in succession. Four of these seedlings developed a very definite fasciation 40 to 60 days after inoculation. Negative results were given by similar experiments on older sweet pea plants 5 to 8 inches in height, and also on geranium and tobacco plants. The organism would appear to be a weak or highly specialized strain of *Bact. tumefaciens* which may occur in the soil or be transmitted by the seed. Infected soil should be sterilized before replanting with sweet peas.

HEDGES (FLORENCE). **Bacterial halo spot of Kudzu.**—Abs. in *Phytopath.*, xvii, 1, p. 48, 1927.

From lesions of the bacterial halo spot of kudzu [*Pueraria hirsuta*], a disease found by the writer in Georgia and Florida, was isolated a polar-flagellate, non-spore-forming, aerobic white organism, pathogenic both to kudzu and Lima bean [*Phaseolus lunatus*]. On beef agar it formed bluish-white, somewhat opalescent, crenate colonies with internal cross-hatching. It liquefied gelatine but did not reduce nitrates. The organism, the superficial signs of whose presence are small brown spots, surrounded by a wide yellow halo strikingly like that in tobacco wildfire, has been tentatively named *Bacterium puerariae*.

MILBRATH (D. G.). **Principles and practices of spraying deciduous fruit trees for control of plant diseases.**—*Monthly Bull. Dept. of Agric. California*, xvi, 1, pp. 20–24, 1 fig., 1927.

In this paper, after giving a brief summary of the periods of activity of the parasitic fungi concerned and the periods of host susceptibility, the author presents a spray schedule for the control, under average conditions, of the following diseases commonly occurring in California: brown rot (*Sclerotinia cinerea*) and shot hole [*Cercospora circumscissa*, *Coryneum beijerinckii*, or *Gloeosporium amygdalinum*: *R.A.M.*, iv, p. 682] on almond; apple scab [*Venturia inaequalis*]; brown rot (*S. cinerea*) and shot hole [*C. beijerinckii*] on apricots; blight (*C. beijerinckii*) and leaf curl (*Exoascus* [*Taphrina*] *deformans*) on peach; and pear scab (*V. pirina*). Instructions are given for the dilutions of lime-sulphur and Bordeaux mixture required in each case, and the time of application is indicated.

KEITT (G. W.). **Studies of Apple scab and Cherry leaf spot infection under controlled conditions.**—Abs. in *Phytopath.*, xvii, 1, p. 45, 1927.

Leaf infection of the cherry by *Coccomyces hiemalis* was initiated

by suspending conidia from cultures in water and applying by an atomizer. The initial stages of infection occurred at constant temperatures ranging from 12° or 13° to 28° C. The maximal and minimal temperatures for the initiation of infection were not established. Lesions developed on inoculated plants incubated at controlled temperatures ranging from 8° to 28°. The minimal incubation periods varied from 6 days at 24° to 11 days at 28°. The minimal period of wetting observed to permit infection was five hours at 20°.

PRETI (G.). **Studio intorno al cancro del Melo ed allo Sphaeropsis malorum.** [Studies on Apple canker and on *Sphaeropsis malorum*.]—*Ann. R. Ist. Sup. Agrar. di Portici*, Ser. III, i, pp. 25–41, 3 figs., 2 graphs, 1926.

These studies refer to a wilt disease of young apple trees associated with a partial desiccation of the branches and characteristic canker formation, which was first observed at Portici in 1923.

An examination of diseased branches revealed the presence of two distinct types of fructifications. The first appeared as black, unilocular, pseudoparenchymatous pycnidia, hyaline towards the centre; the conidiophores were short and thick and the conidia hyaline, granular, guttulate, thick-walled, and 20 to 30 by 8 to 14 μ in diameter. This fungus is referred to *Macrophoma malorum*. The second type, visible as waxy protuberances in the cortex, consisted of rounded or slightly conical pycnidia, embedded in the tissues. These produced conidia which were hyaline at first but became a distinct brown; when mature they were oblong-elliptical, dark brown in colour, and measured 20 to 31 by 8 to 14 μ. The author refers this species to *Sphaeropsis malorum*.

A series of cultures has confirmed the distinctive nature of these two fungi. Cultures of the *Macrophoma* made in March, 1924, produced fruiting bodies after 15 days, containing hyaline, non-septate spores similar to those observed in nature. At the end of May, the conidia became uniseptate and turned brown. On the other hand, the conidia of *S. malorum* were dark coloured from the start and in the majority of cases non-septate, though later, uniseptate spores resembling *Diplodia* were sometimes detected, and more rarely bi- or triseptate spores resembling *Hendersonia*.

Experiments were made to ascertain the effects of temperature on the colour change of the conidia. Three sets of cultures were made: (1) from hyaline, septate conidia; (2) from dark, septate conidia (both these being from the above cultures); and (3) from hyaline conidia taken directly from the host. At 12° to 13° C., the first-named developed hyaline, unseptate conidia; the second, brown, unseptate ones; and the third, hyaline conidia, which, however, darkened immediately the temperature was raised to 16°. At 23°, the conidia of the first set of cultures became slightly browned, those of the second became septate, and those of the third group dark coloured and septate.

Tests of the viability of conidia [of *S. malorum*] taken from branches detached from the plant showed that the germination decreased from 90 per cent. in February, 1924, to 50 per cent. in January, 1925.

The minimum temperature for the germination of conidia of *S. malorum* was found to be 9° to 10°, the maximum 25° to 30°, and the optimum 20°. Light is said to be necessary for normal germination. Conidia of both *S. malorum* and *M. malorum* germinated in about half an hour in water. In hanging drop cultures, germination was inhibited by 0·0001 per cent. copper sulphate, 0·05 per cent. solutions of potassium metabisulphite, aluminium sulphate, or oxalic acid, and 0·06 per cent. iron sulphate.

In discussing the systematic position of the two fungi, the author states that he was able to distinguish readily the pycnidia with hyaline conidia from those with dark coloured ones. It is not clear whether these two fungi are to be regarded as morphologically and physiologically distinct specific entities, but the conidial characters point to such a conclusion. A list of synonyms for each fungus is given, *S. malorum* Berk. non Peck being given as a synonym of *M. malorum* (Berk.) Berl. & Vogl., while *S. pomorum* (Sw.) Cke and *S. pseudodiplodia* (Fuck.) Delacroix are amongst the synonyms of *S. malorum* Peck.

DILLON WESTON (W. A. R.). **Notes on the canker fungus (Nectria galligena Bres.).**—*Trans. Brit. Mycol. Soc.*, xii, 1, pp. 5–12, 3 pl., 1927.

In the spring of 1925, in an orchard of Worcester Pearmain apple trees, a shrivelled fruit was found bearing perithecia of the canker fungus (*Nectria galligena*) [*R.A.M.*, iv, p. 744]. Of 700 fruits collected from the same orchard three only were found bearing perithecia, but on incubating in a dark chamber, others developed perithecia, raising the total to 7 per cent. Twenty-five shrivelled apples collected from cankered spurs produced perithecia in 14 cases and a similar number from clean spurs in only 7 cases. The writer suggests that, excluding the possible external contamination of the shrivelled fruits, either the mycelium works upwards in the spur and petiole to the fruit, or that the latter becomes infected on the tree with conidia or ascospores with the result that overwintering takes place on the fruit. The frequency of other fungi which developed on 307 of the above shrivelled apples were recorded as follows: *Diaporthe perniciosa* on 96 fruits, *Venturia inaequalis* 53, *Cytospora* sp. 46, *Fusarium* sp. 42, and *Monilia* [*Sclerotinia*] *fructigena* 36.

A description is given of the symptoms of eye rot of Worcester Pearmain apples on which the conidial stage of the canker fungus was found. The identity of this species was proved by inoculation into apple trees, and by its behaviour in culture. Inoculations on the fruit gave positive results; in culture no actual perithecia were seen, but the initial stages were produced. It was established that spraying methods adopted to control apple scab [*V. inaequalis*] were also effective in reducing eye rot.

A wilting of the blossom trusses of Worcester Pearmain apples was observed in the same orchard, and 17 out of 25 labelled trusses later developed canker lesions, suggesting that the canker fungus is the cause of this trouble also.

On pear trees the same species of fungus was noticed causing eye

rot of the fruit [ibid., vi, p. 170], and a wilting and discolouring of the trusses and adjacent leaves.

ROSE (D. H.) & BUTLER (L. F.). **Pleospora rot of Lemons and Apples.**—Abs. in *Phytopath.*, xvii, 1, p. 47, 1927.

Cross-inoculations with a species of *Pleospora* (probably *P. herbarum* var. *citrorum*) isolated from decayed lemons from California and from apples shipped from Washington, Oregon, and California, proved that cultures from both lemons and apples were pathogenic to both kinds of fruit and suggested that the causal fungus was identical in both. The rot develops slowly on both fruits, affected tissues being brown to almost black, firm, and rather dry. In lemons the attack is usually confined to the peel, in apples it may penetrate to the core. In culture both ascospores and conidia (*Macrosporium*) were produced, single-spore cultures from these reproducing both kinds of spore in every case.

WILLAMAN (J. J.). **Biochemistry of plant diseases. VII. Correlation between skin texture and flesh texture in Plum varieties.**—*Proc. Soc. Exper. Biol. & Med.*, xxiii, 8, pp. 680–681, 1926.

Previous investigations having suggested that the comparative resistance of certain plum varieties to brown rot [*Sclerotinia cinerea*] was due to two constant factors, namely, tough skin and firm flesh [*R.A.M.*, v, p. 235], a number of measurements of these factors were made on 45 varieties at the Minnesota Fruit Breeding Farm from 1923 to 1925, the results of which are presented in tabular form. A tough skin gives a high puncture value and a firm flesh a low penetration value. These two mechanical factors tend to vary together in plums in different seasons, and at various stages of maturity. Sufficient evidence is now believed to be available to warrant the use of the skin test alone in the study of resistance to brown rot of plums.

ANDERSON (H. W.). **A theory to account for the bactericidal action of sodium silicofluoride and lack of injury to host tissues.**—Abs. in *Phytopath.*, xvii, 1, p. 50, 1927.

The author accounts for the successful control [*R.A.M.*, vi. p. 236] of bacterial spot on peach trees caused by *Bacterium pruni*, by spraying with a 1 in 200 solution of sodium silicofluoride, without serious injury to the host tissues, by the fact that though hydrolysis results in the formation of hydrofluoric acid, which is said to be highly toxic to plant tissues, H-ion determinations show that in solutions at a concentration of 1 in 1,000 or more only partial dissociation occurs. When water is added to the salt which evaporates out when sodium silicofluoride solutions are sprayed on foliage, the silicofluoride may be present in various conditions in which, while the amount of dissociated hydrofluoric acid on the leaf at any time is not sufficient to cause injury, there is enough to check the disease, since a 1 in 25,000 solution of the salt will kill *Bact. pruni* in ten minutes. Hard water used in mixing the sprays, though it reduces the acidity of the solutions, does not interfere with their efficacy.

DUFRÉNOY (J.). **Dépérissement des arbres fruitiers dans le Massif Central.** [The dying off of fruit trees in the Central Massif.] —13 pp., 8 figs., Clermont-Ferrand, G. Mont-Louis, 1927.

The gradual dying off of fruit trees may be due to the attacks of various fungi, the most serious damage being caused by soil-dwelling organisms, e. g., species of *Verticillium*, which have been shown to cause a wilting of apricots in California [*R.A.M.*, iii, p. 47], and of cherries in Holland [ibid., iv, p. 495]. In the central region of France (Brive, Cahors, Montauban, Lyons, Vienne, Valence) apricots are often affected with a wilting of the larger branches during the summer, after having shown a yellowing of the leaves during previous seasons. Black or brown spots of variable shape and size are found in the wood of the affected stems and also of the stocks on which they are grafted. Isolations from the margins of these spots yielded a species of *Verticillium*.

Similar symptoms were noticed in walnut trees (*Juglans* spp.). Cankers were found externally on the collar and roots of the affected trees and internally there was a discoloration of the wood of the branches and trunks, usually in streaks. The study of these lesions and the parasites responsible for them is still in progress, but species of *Verticillium* have already been isolated in several cases. Brown patches in the wood of walnut trees were also found associated with attack by *Armillaria mellea*, and in this case the usual control methods are recommended [ibid., v, p. 526]. The application of chemical manures to affected walnut trees to stimulate their resistance to the disease is also advocated. Trials are at present being carried out as to the most suitable compounds for the different types of soil.

GLOYER (W. O.). **The dwarfing, shrivelling, and dropping of Cherries and Prunes.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 540, 18 pp., 4 pl., 1 fig., 1926.

A condition referred to as 'small cherry', characterized by a portion of the crop being undersized and worthless, was first noticed in Sodus, New York, in 1925 on English Morello cherry trees. On the same branches, fruit in all stages of desiccation was observed. The fruit fails to increase in size and may then gradually shrivel and remain hanging on the tree, or it may show a marked depression about the stem end and then drop. Lesions which are bright red at first and later brown occur on the pedicels.

The fungus, *Coniothyrium olivaceum*, was constantly associated with the lesions, but observations and spraying experiments made in 1926 showed that the primary injury was due to lead arsenate and the fungus was merely a saprophyte invading the injured tissue. The pedicel injury and the subsequent dropping of the fruit occurred when the lead arsenate was combined with Bordeaux mixture, lime-sulphur, wettable sulphur, or sulphur dust. The injury was least where light applications of the two last-named fungicides were made, but their efficiency in controlling the shot hole fungus (*Coccomyces hiemalis*) was not established, as there was but slight infection during that year. The susceptibility of the Morello cherry to the latter disease necessitates at least three to four sprays for its control, and the author recommends that lime-sulphur should be

used for the first three applications and a light dose of sulphur-lead arsenate dust (90–10) for the fourth, or wettable sulphur could be used for the third and fourth sprayings.

Applications of lead arsenate also caused injury to several varieties of prunes similar to that produced on the above host.

RATHBUN-GRAVATT (ANNIE). **A witches' broom of introduced Japanese Cherry trees.**—*Phytopath.*, xvii, 1, pp. 19–24, 1 fig., 1927.

This paper contains an account of a witches' broom of Japanese cherry trees, caused by *Exoascus* [*Taphrina*] *cerasi*. The disease was introduced near Chevy Chase, Maryland, in 1906, and into Potomac Park, Washington, D.C., in 1912, in separate shipments of trees. The Yoshino variety (*Prunus yedoensis*) was attacked the most, but the Asagi variety (*P. lannesiana*) was also found infected. Nineteen trees out of about a thousand of the former variety in Potomac Park showed infection in 1917. All were grafted trees, so that the disease may have been transmitted to them by grafting. By cutting down and burning or by heavy pruning the disease was entirely eliminated in this area by 1919, and in Chevy Chase by 1917. This is thought to have been due to the fact that the disease spread very slowly under the conditions prevailing in the above-mentioned areas.

The occurrence of this disease in other localities is summarized, and a list is given of its reported hosts. These include *P. avium*, one of the stocks used for grafting the Japanese cherry trees.

NOLEN (R. E.). **Pecan scab.**—*Florida Agric. Exper. Stat. Bull.* 181, 26 pp., 8 figs., 1926. [Received April, 1927.]

The present bulletin gives a popular account of pecan (*Hicoria* [*Carya*] *pecan*) scab caused by *Fusicladium effusum* [*R.A.M.*, iv, p. 72; v, p. 750; see also vi, p. 106].

After discussing the distribution, economic importance, and symptoms of the disease, the author describes the results of a large number of spore measurements made with the object of discovering whether more than one strain of the fungus exists. No significant differences were observed except in the case of the variety Delmas, on which spores from one district differed in length from those in other parts of the State. Chlamydospores are said to be common in culture and are occasionally found in the field. Cultural studies showed that the optimum temperature for the growth of the fungus on various media lies between 68° and 77° F., while it developed but poorly at 59° and at 86°. Inoculation experiments with pure cultures on trees in the field and in the greenhouse were successful, the period of incubation being from 5 to 21 days in the field and 4 to 9 days in the laboratory [ibid., v, p. 717].

Humidity was found to be as important as temperature for the development of scab; the worst infections occurred during the years of heaviest rainfall and only light infections in dry years. A correlation was also found between the rainfall and percentage of new scab infections recorded weekly during the 1923 season.

The fungus is said to be disseminated by wind, rain, insects, and man. The date of the first infection depends on that of the onset

of growth of new foliage. The disease has been observed on the leaves about two weeks after the buds opened and on the nuts three weeks after the pistillate flowers had died. No infection was obtained on leaves more than two weeks old.

Varietal susceptibility varies in different localities and in some cases at different stages of growth. Of the varieties Van Deman, San Saba, Halbert, and Delmas, which are extremely susceptible in Florida, the first-named is resistant in Mississipi and the others in western Texas. Other varieties susceptible in Florida are Schley, Alley, Pabst, Moore, Kennedy, and Curtis, while Teche, Frotscher, Stuart, and Moneymaker are the most resistant. Varieties resistant at first have been known gradually to become susceptible.

ANDREW (R. E.) & GARMAN (P.). **A chemical investigation of some standard spray mixtures.**—*Connecticut Agric. Exper. Stat. Bull.* 278, pp. 491–508, 1926. [Received 1927.]

A series of investigations [the methods and results of which are presented in tabular form and discussed] was carried out on the chemical composition and reaction of various combinations of certain fungicidal and insecticidal spray materials.

Lime-sulphur was found to react strongly with lead arsenate, giving increased soluble arsenic and decreased sulphur in solution. It reacts similarly with lead arsenate and nicotine sulphate in combination and with lead arsenate and casein-lime, but the reaction is not as great in the latter case.

Nicotine sulphate does not appear to react with lime-sulphur, but when added to lead arsenate and lime-sulphur together there is a marked decrease in soluble arsenic and also in the amount of sulphur in solution. Variable results were obtained by the addition of nicotine sulphate to triple combinations of lead arsenate, casein-lime, and lime-sulphur.

Casein-lime when mixed with lime-sulphur alone reduces the amount of sulphur in solution, but when added to lime-sulphur and nicotine sulphate the sulphur content of the solution is not much altered. In quadruple mixtures of lime-sulphur, casein-lime, lead arsenate, and nicotine sulphate there is generally a decrease of sulphur in solution due to the casein-lime, and also a decrease in soluble arsenic, though the latter may sometimes be augmented. The lime in casein-lime was found to be largely responsible for the decrease in soluble arsenic when this occurred. Colloidal sulphur was sometimes formed in the spray mixtures. The colour of the mixture was not found to be a reliable method of judging a spray solution.

So many factors are involved in the composition of quadruple mixtures and in the variations resulting from the order of mixing that the selection of improved mixtures appears to present insuperable difficulties.

HESLER (L. R.). **The teaching of elementary plant pathology.**—*Phytopath.*, xvi, 10, pp. 739–744, 1926.

In this communication, which was read before the American Phytopathological Society at Kansas City in December, 1925, the writer deals in general with the aims and objects of the teaching

of elementary plant pathology. The organization of the course on the crop-basis system is recommended, and in laboratory work, descriptive plant pathology, with the aid of a wide selection of material, cultures, and diagrams, is regarded as most important. The value of written work, especially of something in the nature of a short thesis, is emphasized. Throughout the whole course the development of principles rather than the presentation of cut and dried formulae should be aimed at, while the final objective should be to increase the capacity of the student, and to develop and discipline his whole mind.

VIALA (P.). **La lutte contre les ennemis des cultures.** [The campaign against pests of economic plants.]—*La Vie Agric. et Rurale*, xxx, 2, p. 28, 1927.

The establishment is announced of a body known as the 'Ligue nationale de lutte contre les ennemis des cultures', which has been formed in Paris to assist the Agricultural Research Institute and the Phytopathological Service in their campaign against the pests of economic plants. The scope and mode of administration of the society are briefly indicated.

GÄUMANN (E.). **Die wirtschaftliche Bedeutung unserer wichtigeren Pflanzenkrankheiten.** [The economic significance of our principal plant diseases.]—*Landw. Jahrb. der Schweiz*, xli, 2, pp. 319–324, 1927.

This paper furnishes, with the help of data from other countries, brief estimates of the average annual losses in Switzerland due to fungous diseases of plants. For lack of a national plant pathological service, the estimates are based on figures obtained from private sources. They are stated to be throughout on the low side.

Calculating the average gross yield from cereal crops at a value of 50 to 55 million Swiss francs [£2,000,000 to £2,200,000], the direct loss due to smuts (Ustilaginaceae) is estimated at some Fr. 1,500,000 per annum. To this must be added the cost of prophylactic measures, including the purchase of disinfectants and the additional labour necessitated for their application, estimated at some Fr. 150,000.

As Switzerland's chief rainfall is in the summer, loss from rusts (Uredinaceae) may be assumed to be greater than in more favoured cereal-growing countries. If it be estimated at 20 per cent. of the yield, which estimate is undoubtedly too low, its amount would be about Fr. 10,000,000 annually.

To these must be added losses from snow mould (*Fusarium nivale*) [*Calonectria graminicola*], foot rot (*Ophiobolus herpotrichus*), mildew (*Erysiphe graminis*), and ergot (*Claviceps purpurea*), which cannot be calculated as the figures of other countries are not applicable to Switzerland.

Altogether the average annual loss due to these six cereal diseases combined may be estimated at Fr. 10,000,000 to 12,000,000.

Loss occasioned by late blight of potatoes (*Phytophthora infestans*) is estimated at from 5 to 10 per cent., and by leaf roll and mosaic at a similar percentage, but it is stated that at the present time no basis exists in Switzerland for the calculation of losses from

the two last-named diseases or from various others which are enumerated. The total loss from potato diseases may be estimated at from 30 to 40 per cent. of the yield, or, calculating the annual value of the gross yield at Fr. 52,000,000, at Fr. 15,000,000 to 20,000,000.

Apart from the costs of spraying, estimated by the Farmers Secretariat at some Fr. 400 per hect., or Fr. 5,000,000 for the entire area under vines, the annual vine yield suffers a reduction of about 10 per cent. due to the ravages of downy mildew (*Plasmopara viticola*) and *Oidium* (*Uncinula necator*). Taking into account injury from other [enumerated] diseases, the total loss may be estimated at not less than Fr. 15,000,000 to 20,000,000 on a gross yield valued at Fr. 60,000,000 to 70,000,000.

A low estimate for the loss suffered by the apple harvest from scab (*Venturia inaequalis*) is 30 per cent., and the additional loss from the other diseases mentioned, although difficult to gauge, may well be estimated at considerably over 5 per cent. The annual loss on the pear yield from scab (*Venturia pirina*) is also not less than 30 per cent., and on the quince yield from *Sclerotinia linhartiana* it is at least 50 per cent. Injury to cherry trees from shot hole (*Clasterosporium carpophilum*) [*Coryneum beijerinckii*] alone accounts for a loss of not less than 30 per cent. of the harvest. *C. beijerinckii*, and species of *Taphrina*, *Sclerotinia*, and *Polyporus* reduce by from 10 to 15 per cent. the damson, plum, apricot, and peach yields. Altogether the total average loss to the Swiss fruit harvest from fungous diseases may be estimated at from 30 to 35 per cent. annually on a value of some Fr. 100,000,000. If the average gross small fruit and vegetable yield, which comprises currants, gooseberries, raspberries, strawberries, tomatoes, beans, peas, *Brassica* species, and celery, be valued at Fr. 30,000,000 to 35,000,000 per annum, the loss from their diseases may be computed at not less than Fr. 3,000,000 to 5,000,000, or at least 10 per cent.

Leaving out of account the losses suffered in pastures and forests, the amount of which can scarcely be determined, a low estimate places the total losses incurred in Swiss agriculture through fungous diseases at some Fr. 70,000,000 to 90,000,000 per annum.

SCHLUMBERGER (O.). **Ueber die Möglichkeit einer Versicherung gegen Schäden durch Pflanzenkrankheiten.** [On the possibility of insuring against damage from plant diseases.]—*Illus. Landw. Zeit.*, xlvii, 6, pp. 75–77, 1927.

Some of the outstanding difficulties in connexion with any scheme of insurance against damage from plant diseases are discussed, with special reference to rust of cereals [*Puccinia* spp.], which is stated to have caused immense losses in Germany in 1926 [*R.A.M.*, vi, pp. 345–7].

The first condition of such a form of insurance is the measurability of the damage incurred. In the case of rust no difficulties would be presented, since the degree of injury caused by the fungus is readily calculable by experts. This type of damage, in fact, is more easily estimated than that due to hail, against which farmers are commonly insured. In certain other diseases, however, their

dependence on injury due to hail or other meteorological conditions would cause difficulty.

A much more complex problem is the decision to what extent the injury was avoidable by proper cultural measures, since compensation is obviously not payable in cases of gross neglect or ignorance.

An important point in connexion with insurance against plant diseases is the question of cultivation of immune varieties, which might in certain cases, e.g., wart diseases of potatoes [*Synchytrium endobioticum*], be enforced by the insurance companies.

Insurance is clearly not indicated in the case of diseases which can be eliminated or reduced to a minimum by direct control measures, such as the powdery and downy mildews of the vine [*Uncinula necator* and *Plasmopara viticola*] and some of the cereal smuts.

It is pointed out that insurance companies could not be expected to take any liability in the case of diseases which are endemic in particular localities, but only for those occurring more or less over the entire country as a result of unforeseen circumstances, especially climatic. In order to enable the companies to collect sufficient assets for the payment of compensation claims, it would be necessary for members to take out policies covering a reasonable period, irrespective of the fact that rust epidemics are comparatively infrequent.

SMITH (FANNY F.). **Some cytological and physiological studies of mosaic diseases and leaf variegations.**—*Ann. Missouri Bot. Gard.*, xiii, 4, pp. 425–484, 4 pl., 4 figs., 1926. [Received April, 1927.]

After giving a comprehensive review of the previous work done by prominent investigators in the study of mosaic diseases of plants and of leaf variegations, the author briefly describes her own cytological and physiological researches in the case of the mosaics of tobacco, *Petunia* sp., columbine (*Aquilegia coerulea*), pokeweed (*Phytolacca decandra*), and Jimson weed (*Datura stramonium*), and of leaf variegations of *Homalomena cordata*, *Ficus parcellii*, *Nerium oleander*, *Coleus blumei* var. Mrs. Kirkpatrick, *Bougainvillea glabra* var. *variegata*, *Pittosporum tobira* var. *variegatum*, and *Euonymus japonica* var. *argentea-variegata* and var. *medio-picta*.

Examination of epidermal and hair cells of tobacco in living and fixed conditions agreed with Miss Goldstein's observations [*R.A.M.*, iv, p. 47; see also vi, p. 260] in that the intracellular vacuolate bodies and plate-like crystals were independent of the nuclei, and the crystals lost their typical structure when placed in chromacetic acid, but the present author failed to observe any autonomous movement of the vacuolate bodies and only in one instance could the appearance of a limiting membrane be identified. A confirmation was also obtained of Rawlins's and Johnson's observations [ibid., iv, p. 362] that cell inclusions occurred more frequently in tobacco plants grown in greenhouses than in those grown out of doors, and, in order to test whether this may be due to the action of ultra-violet rays, mosaic-infected plants were treated with the longer or biological ultra-violet rays. After eighteen days of such treatment the plants showed dwarfing and a masking of mosaic symptoms,

but no reduction of the cell inclusions was noted in them as compared to the controls. It is therefore concluded that the absence of the inclusions in plants grown out of doors is not associated with the ultra-violet rays which they receive from sunlight. Experiments conducted to test the action of the shorter or abiotic ultra-violet rays showed that filtered mosaic tobacco juice was inactivated by an exposure of 30 minutes to them, while, under similar treatment, a suspension of *Bacillus prodigiosus* was killed in 30 seconds; this is considered as evidence against the theory that the causal agency of mosaic is an organism.

In living epidermal and hair cells of *Petunia* showing a rapid streaming of the cytoplasm the vacuolate bodies exhibited two movements: a translation through the cell and a change of form; the latter is interpreted as resulting from a combination of the effect of the force exerted on the mobile body by the streaming protoplasm and the apparent changes in form due to its turning over in the streams. In *Petunia* the intracellular vacuolate bodies and plate-like crystals were both relatively highly resistant to the action of formalin, HCl, and HNO_3, and both were similarly soluble in KOH. They differed, however, in that the crystals were soluble in 10 to 95 per cent. alcohol and 1 to 10 per cent. acetic acid, whereas the vacuolate bodies were soluble only in 95 per cent. alcohol.

Anatomical investigation of mosaic-infected leaves of *Datura*, *Phytolacca*, and *Aquilegia* showed that the virus stimulated the development of the cells in the dark green areas and inhibited it in the chlorotic areas, neither, therefore, being normal. In the chlorotic areas the reduction of tissue was localized particularly in the palisade layers, and the chlorosis was accompanied by a decrease in size and number of the chloroplasts. The cells in the chlorotic areas of *Datura* contained irregular, granular, and vacuolate bodies in association with the nuclei, comparable to those described in maize by Kunkel [ibid., i, p. 194]; such inclusions were not found in the dark green areas of the diseased leaves or in the healthy tissues. Similar bodies were only occasionally observed in the chlorotic areas of *Phytolacca*, and never in the chlorotic areas of *Aquilegia*.

No inclusions were found associated with the chlorotic areas in *H. cordata*, *F. parcellii*, *B. glabra*, *P. tobira*, *N. oleander*, and *C. blumei* investigated, while vacuolate bodies were observed in the mesophyll cells of the chlorotic areas of the two varieties of *E. japonica* studied, which belong to the species in which Baur found infectious chlorosis.

The author considers, therefore, that the vacuolate and granular bodies are associated directly with the causal agency of mosaic rather than with the chlorosis which results from the presence of the virus in the plant; she favours, however, the view that they do not represent the causal agency, but are the product of a reaction between it and the cytoplasm.

KUNKEL (L. O.). **Some characteristics of virus diseases of plants.** —*Journ. of Bact.*, xiii, 1, pp. 23–24, 1927.

sented at the 28th annual meeting of the Society of American Bacteriologists, held at Philadelphia on 28th to 30th December, 1926.

Virus diseases of plants are stated to be systemic maladies, generally producing marked chlorosis. They are caused by filter-passing agents and may be divided into two general types. In the first, chlorosis is noticeable in all chlorophyll-bearing tissues and diseased plants are yellowed. In the second, chlorosis is confined to certain irregularly distributed areas, producing a mosaic pattern. Stunting, erect habit of growth, and abnormal production of secondary shoots are common to both types. The plants are seldom killed outright. Some of the filterable virus diseases are highly infectious, many are spread by sucking insects, some are transferred with considerable difficulty, while others are apparently transmissible only by grafting. Rapidly growing plants are most easily infected.

LEROUX (L.). **Le bactériophage chez les végétaux.** [The bacteriophage in plants.]—*Rev. Gén. des Sciences*, xxxvii, 3, pp. 67–68, 1927.

The views of d'Hérelle and others on the nature of the bacteriophage are briefly stated, and references are given to the work of Sibilia [*R.A.M.*, v, p. 756] on its association with plant pathogens.

COSTANTIN (J.) & DUFOUR (L.). **Recherches sur les relations du Pin sylvestre et du bolet granulé.** [Studies on the relations between Scotch Pine and *Boletus granulatus*.]—*Ann. Sci. Nat., Bot.*, Sér. X, ix, 1, pp. 271–281, 2 figs., 1927.

The association of *Boletus* (*B. luteus*, *B. elegans*, &c.) in a symbiotic partnership with the larch (*Larix europaea*) and *Pinus sylvestris* was established by Melin [*R.A.M.*, iv, p. 430]. In the present paper, an account is given of the authors' attempts to determine a similar association in the case of *B. granulatus*, fruit bodies of which were observed around the roots of *P. sylvestris*.

Pure cultures of the mycelium of *B. granulatus* were mixed with the soil around seedlings of *P. sylvestris*, which two and a half years later were found to be superior in height to seedlings in a neighbouring plot not so treated. Though both sets bore mycorrhiza, it is suggested that those of the non-inoculated seedlings were formed by other fungi. Sporophores were not observed.

Seedlings from the two plots were transplanted into pots about two months after the inoculations were made. Those from the inoculated plot all survived, while half of those from the other died and the remainder were smaller than the first.

Seed was also sown in sterilized pots, half of which were inoculated with the mycelium of *B. granulatus*. The inoculated seed gave 58 seedlings and the non-inoculated 44.

The experiments were too few to justify the formation of definite

UTKIN (M. S.). Вертициллиум (**Verticillium albo-atrum Rein. et Bert.**) и завядание Картофеля, Томатов, Огурцов и других растений. [*Verticillium albo-atrum* Rein. et Bert., and wilt of Potatoes, Tomatoes, Cucumbers, and other plants.]—*Научно-Агроном. Журнал* [*Journ. of Scient. Agron.*], [*1926* ?], 12, pp. 787–810, 5 figs., [1926 ?]. [English summary.]

The present paper gives a cursory historical account of the genus *Verticillium* and a brief description of the symptoms of wilt or tracheomycosis, chiefly in potato and tomato, caused by *V. albo-atrum*, which entirely agrees with that of Bewley [*R.A.M.*, ii, p. 148]. An account is also given of the author's experiments and field observations conducted in the period from 1921 to 1925, at the Phytopathological and Selection Stations of the Timiryazeff Agricultural Academy near Moscow, to determine the incidence and severity of attack of the fungus on a large number of listed varieties of potato, and the relationship between host and parasite. The results indicate that different varieties vary considerably in their susceptibility, this being mainly attributed to their varying susceptibility to the attacks of root-destroying insects and micro-organisms, since in the author's experiments *V. albo-atrum* was never observed to be able to gain entry through the uninjured cuticle of healthy rootlets. Great differences were also noted in the behaviour of the progeny from infected plants, some of the daughter tubers giving rise to entirely healthy plants, while others produced either partially or entirely infected plants. An explanation of this observation is offered, based on the spread of the fungus through the vessels: if the mycelium present in the mother tuber succeeds in reaching the daughter tuber before harvest, the latter will give rise to partially or entirely infected plants, whereas when the mycelium fails to reach the daughter tuber through the stolons the progeny will be healthy. This observation stresses the necessity of selecting seed tubers from plants which remain healthy throughout the growing season, and not from tubers harvested promiscuously, as no outward symptoms exist to indicate internal infection, and the infected tubers do not rot when stored under proper conditions. In regard to incidence, field observations showed that *V. albo-atrum* is widely distributed in heavy loam soils with a high organic content in the neighbourhood of Moscow, the losses caused by it to the crops frequently attaining 25 per cent. or more.

Brief notes are also given as to the damage caused by the fungus to tomatoes and cucumbers in the same region.

COSTANTIN (J.). **Un programme pour la lutte contre la dégénérescence des Pommes de terre.** [A programme for the control of the degeneration of Potatoes.]—*Ann. Sci. Nat. Bot.*, Sér. X, ix, 1, pp. 281–284, 1927.

In this paper the author discusses the influence of elevated situations in reducing potato degeneration diseases [*R.A.M.*, iv, p. 372]. In view of the frequent absence of mycorrhizal fungi in the cultivated potato, and their presence in the wild forms occurring in the Andes, he considers it necessary to find other means of securing

believed to replace, in part at least, the injurious effects of asymbiotic growth. Other methods of combating degeneration diseases are briefly reviewed.

PERRET (C.). **A propos de la filosité de la Pomme de terre.** [On filosité of the Potato.]—*Rev. Path. Vég. et Ent. Agric.*, xiii, 4, pp. 319–322, 1926.

Observations on filosité of the potato made by the author in Loire confirm the conclusions arrived at by Ducomet [*R.A.M.*, vi, p. 181] in regard to the nature of this disease. A study of the behaviour of different families of potatoes showed that the antecedents determine in general the type of germination of any tuber. Seven types of germination are distinguished, one of which is the typical filosité. Although there seems to be no doubt that the mother plant has a marked influence on the appearance of filosité in subsequent generations, the irregularities in hereditary transmission lead the author to conclude that it is a disease able to persist in the tuber in a latent form, rather than to accept the view that it is simply a Mendelian character. A case is cited of tubers from five families planted in the spring of 1926, which had up till then germinated well. In only one family was this the case in 1926, the other four showing as many as 20 per cent. affected tubers; it was noticeable that in the latter the incidence of leaf roll coincided with the irregularity in germination.

SCHLUMBERGER (O.). **Die neuen krebsfesten Kartoffelsorten.** [The new wart-immune Potato varieties.]—*Deutsche Landw. Presse*, liv, 3, pp. 26–27, 1927.

Particulars are given of the distinguishing characteristics of the twelve new varieties of potatoes completely immune from wart disease [*Synchytrium endobioticum*] approved by the Biologische Reichsanstalt, namely, Ada I, formerly Altmark (Paulsen); Beate I (Paulsen); Frühe Königin (Stieff); Goldappel, formerly Goldperle (Paulsen); Graf Dohna (Paulsen); Hellena (Paulsen); Kaiserkrone, Staudenauslese (Stieff); Primrose (Roesicke); Roon, Seydlitz, Tann, and Wallenstein (Pommersche Saatzuchtgesellschaft). The number of approved immune varieties is increased by these additions from 32 to 44 [*R.A.M.*, v, p. 512].

TROTTER (A.). **Sulla presenza della 'Lasiodiplodia tubericola' Ell. et Evr. in Egitto ('Java black-rot') e sul pericolo della sua introduzione in Italia.** [On the presence of *Lasiodiplodia tubericola* Ell. and Ever. in Egypt ('Java black-rot') and the danger of its introduction into Italy.]—*Boll. R. Staz. Pat. Veg.*, vii, 1, pp. 93–98, 4 figs., 1927.

Samples of sweet potato (*Ipomoea batatas*) coming from Egypt were found on examination at Naples to be infected with a form of rot agreeing with the 'Java black-rot' (*Lasiodiplodia* [*Botryodiplodia*] *tubericola*) [*R.A.M.*, ii, p. 256; iii, p. 366] introduced into the United States from Java in 1894, and now extremely prevalent in America. This fungus causes a dry rot which progresses out-

affected tubers showed a yellowish coloration of the tissues, darkening later to coal black. On subsequent consignments of similarly affected tubers the typical pycnidia of *B. tubericola* were found.

There seemed to be no doubt that the tubers were infected before shipping, although probably appearing quite sound at the time. Conditions during transport evidently favoured the development of the rot. The fact that up to the present sweet potatoes grown in Italy (where their cultivation is extending) have shown no signs of disease leads the author to recommend that steps be taken to keep out this disease by careful inspection at the ports and, if necessary, by the exclusion of sweet potatoes from countries where it is prevalent.

GRATZ (L. O.). **Irish Potato disease investigations, 1924–25. (A preliminary report.)**—*Florida Agric. Exper. Stat. Bull.* 176, 23 pp., 6 figs., 1925. [Received April, 1927.]

The present bulletin embodies the preliminary results obtained by the Florida Agricultural Station during the years 1924 and 1925 in the investigation of various potato diseases. The rot of seed tubers caused by *Alternaria solani* [*R.A.M.*, iv, p. 699] is stated to be of considerable economic importance in Florida, as it not only destroys the germinative power of affected setts, but provides an easy entrance for the dry rot organisms into stored potatoes. The causal fungus was isolated from rotted potatoes shipped to Florida from Maine, New Jersey, New York, Wisconsin, and in a few cases from home grown potatoes which were kept for several weeks after digging. No lesions were observed at the time of digging. The Spaulding Rose No. 4 variety appears to be the most susceptible, but the fungus was also isolated from Early Rose, Irish Cobbler, Green Mountain, and Smooth Rural. There was some evidence that setts infected with *A. solani* may be responsible for outbreaks of early blight in the following crop.

Another disease which caused considerable concern to the local growers in 1924 and 1925 was a semi-soft, watery, brownish rot, with a pungent odour, which, in some cases, destroyed up to 40 per cent. of the setts in the field within 10 to 20 days of their planting. An internal discoloration or a wilt of the young stems was observed in a very few cases. In both years a species of *Fusarium* was consistently found associated with the rot, and the latter was easily reproduced by inoculating sterilized soil and clean seed-pieces with this organism. Sterilization experiments with infected soil suggested that infection originates in the soil. Field observations and experiments under controlled conditions indicated that moisture and temperature are among the chief factors regulating the development of the fungus. Further experiments showed that the disease was not controlled by treating the setts with sulphur dust or other drying agents, such as lime, plaster of Paris, or cement.

Promising results were obtained during the two years under review in experiments on the control of the *Rhizoctonia* disease caused by *Corticium vagum* [*C. solani*] by treating the seed tubers several weeks before planting for 1½ hours in a cold 1 in 1,000 solution of mercuric chloride, after which they were rapidly dried, direct sunlight being avoided. In four out of five plots the treated

tubers produced from 1·8 to 11·6 bushels more per acre than the controls, the resulting crops being remarkably free from infection.

Experiments were also made in the control of late blight [*Phytophthora infestans*]. In 1924 comparative tests were made with three strengths of commercial copper-lime dust (20–80, 25–75, and 30–70 per cent., respectively). The results showed a rather consistent increase in the yield of the dusted rows as compared to the controls, which died some ten days before the former, although no late blight occurred in the fields in that year. Early blight (*Alternaria solani*) was severe and was not controlled by any of the dusts [ibid., vi, p. 314]. In 1925 the experiments were directed towards determining the relative efficiency of copper-lime dust and Bordeaux spray, the same amount of metallic copper being applied per unit of surface in both treatments. Commercial control of late blight was obtained in all cases, and the dusted plants gave approximately the same yields as those sprayed. The control rows gave consistently lower yields throughout. In another experiment the sprayed rows produced the highest percentage of marketable and prime potatoes, and usually the largest total and the largest marketable yield.

AUBERTOT (M.). **La flagellose des Euphorbes dans l'Est de la France.** [Flagellosis of *Euphorbia* in eastern France.]—*Bull. Soc. Path. Exot.*, xx, 1, pp. 14–19, 1927.

Of the three common species of *Euphorbia*, *E. cyparissias*, *E. helioscopia*, and *E. peplus*, examined by the author in Alsace, Savoy, and on the Langres Plateau, only the first-named contained in its latex *Leptomonas davidi*, which was found on 22 per cent. of the plants examined in these areas [*R.A.M.*, v, p. 760]. In every case phytophagous Hemiptera, frequently harbouring flagellates themselves, were found in the neighbourhood of the infested plants. The latex of the plants containing protozoa was usually remarkably poor in starch, a fact tentatively attributed by the writer to its utilization by these organisms, but there were no external symptoms.

O'B[RIEN] (T. E. H.). **Report on effect of Bordeaux mixture on the properties of plantation Rubber.**—*Fourth Quart. Circ. for 1926, Rubber Res. Scheme (Ceylon)*, pp. 13–18, 1926.

The writer gives the results of laboratory experiments, carried out in co-operation with the Imperial Institute, London, to determine the effect of adding specific quantities of Bordeaux mixture to rubber latex before coagulation [*R.A.M.*, vi, p. 372]. Two sets of samples of crepe were prepared containing from 0·2 to 5·0 per cent., and from 0·02 to 0·5 per cent. Bordeaux mixture, respectively. After six months, those containing the larger amounts of Bordeaux were found to be soft and tacky, a result which was confirmed by plasticity determinations. Analysis showed that only a small part of the copper added to the latex as Bordeaux mixture was found in the crepe. The presence of 0·02 per cent. of the mixture in the latex or less than 0·00005 per cent. of copper in the raw rubber was sufficient to cause a softening in the latter. Ageing tests showed that all samples prepared from latex containing Bordeaux mixture

were inferior to the corresponding controls. Where 0·10 per cent. or less was added the inferiority was only slight, but it increased with the amount of Bordeaux added.

BOOBERG (G.). **Beknopte samenvatting van de voorloopige resultaten der vakkenproeven over verschillende onderwerpen.** [Brief summary of the preliminary results of experiments in various matters.]—*Korte Meded. Proefstat. Java Suikerind.* 77 (*Arch. Suikerind. Nederl.-Indië*, xxxv, 10), pp. 233–270, 2 graphs, 1927.

The following items in this paper (pp. 253–270) are of phytopathological interest. The deleterious effect on the sugar-cane yield of the use of mosaic setts was again demonstrated.

The results of 38 experiments [which are presented in tabular form and discussed] in the control of sereh disease by the hot water treatment [*R.A.M.*, v, pp. 328, 329] showed that heavily infected treated canes contracted on an average 9 per cent. infection, compared with 25·4 per cent. in heavily infected untreated canes, 8 per cent. in ordinary selected material, and 1·1 per cent. in setts from hill gardens. One hour's immersion at 51·8° C. gave better results than 40 or 20 minutes. The effect of the treatment was found to persist in the second generation.

KUNKEL (L. O.). **The Corn mosaic of Hawaii distinct from Sugar Cane mosaic.**—Abs. in *Phytopath.*, xvii, 1, p. 41, 1927.

Experiments with the maize leaf-hopper, *Peregrinus maidis* Ashm., from North Carolina show that this insect cannot transmit the virus of the sugar-cane mosaic of the United States to maize. A careful comparison, made at the Experiment Station of the Hawaiian Sugar Planters' Association, indicates that this insect is identical with the Hawaiian *P. maidis* which transmits the virus of the mosaic disease of maize studied by the writer in Hawaii. These data suggest that the destructive mosaic of maize prevalent in Hawaii is distinct from sugar-cane mosaic and from the maize mosaic occurring in Louisiana and other southern States.

SMALL (W.). **Rhizoctonia bataticola (Taub.) Butler.**—*Trop. Agriculturist*, lxvii, 4, pp. 237–241, 1926.

With the two exceptions of chillies (*Capsicum* spp.), on which it has been reported to cause fruit rot in the United States, and cacao, in the roots of which it had been found in Uganda [*R.A.M.*, v, p. 16], the hosts mentioned below are new for this fungus.

The author has found *Rhizoctonia bataticola* in Ceylon on *Hevea brasiliensis* either alone or in association with a fruiting *Xylaria* (probably *X. thwaitesii*) [ibid., iii, p. 576] or *Sphaerostilbe repens*. It was present alone on roses and chillies, with a *Poria* on *Hibiscus* sp. and *Aralia filicifolia*, and with *Fomes lignosus* on a cork-wood tree (*Ochroma lagopus*). The fungus was detected in the smaller roots of a consignment of seven cacao trees from the Experiment Station, Peradeniya; a *Nectria* was fruiting on the stems and in one case *Ustulina zonata* was present also. Attention is drawn to the fact that the *Rhizoctonia* may be confined to the smaller roots

of woody plants and its presence may be overlooked if only the larger roots are examined; a characteristic sign of its presence is the hardening of the wood and the frequent occurrence in it of sclerotia and sclerotial plates.

SMALL (W.). **Further occurrences of Rhizoctonia bataticola (Taub.) Butler.**—*Trop. Agriculturist*, lxvii, 6, pp. 323–326, 1926.

The author describes in this paper the occurrence of *Rhizoctonia bataticola* in cases of root diseases of various hosts in Ceylon [*R.A.M.*, vi, p. 57 and last abstract], associated in many instances with other pathogenic fungi, though in not less than 50 per cent. of the cases recently examined it occurred alone. It is recorded for the first time on *Acacia elata*, *Tristana conferta*, and *Cupressus macrocarpa*, all of which it attacked and killed.

SMALL (W.). **Further notes on Rhizoctonia bataticola (Taub.) Butler.**—*Trop. Agriculturist*, lxviii, 2, pp. 73–75, 1 pl., 1927.

The new hosts of *Rhizoctonia bataticola* recorded in these notes are *Coffea robusta*, seedlings of *Albizzia moluccana*, plantains [*Musa paradisiaca*], tomato, orange, and *Amherstia nobilis*, bringing the number of species affected by the fungus in Ceylon to 27 [see preceding abstracts].

The fungus was found in cases of root disease of plantains in which the symptoms resembled those of the Australian bunchy-top disease [*R.A.M.*, vi, p. 173]. Some trees of *Hevea brasiliensis* attacked by a root disease in which *R. bataticola* appeared to be the only fungus present were allowed to stand for five months; at the end of the period *Ustulina* [*zonata*], *Fomes lignosus*, *F. lamaoensis*, and *Diplodia* [*Botryodiplodia theobromae*] were present in addition to the *Rhizoctonia*, indicating that the four first-named fungi were secondary. A large number of recent examinations of the roots of diseased rubber trees has resulted in the detection of *R. bataticola* in each case; in one instance it was found on every rubber tree in a *Fomes* patch and it has been present in all recent cases of *Diplodia* die-back.

HIGGINS (B. B.). **Physiology and parasitism of Sclerotium rolfsii.**—Abs. in *Phytopath.*, xvii, 1, p. 53, 1927.

Investigations showed the minimum, optimum, and maximum temperatures for the growth of *Sclerotium rolfsii* to be 8°, 30° to 35°, and 40° C., respectively, the maximum temperature for continued normal growth being about 37°. Freezing killed the vegetative mycelium, but the sclerotia withstood a temperature of —10° for forty-eight hours. The fungus grows on beef-extract-peptone broth from P_H 1·4 to 8·3, the principal by-products of growth being ammonia and oxalic acid, with traces of succinic and formic acids. The mycelium grows over the surface of a plant, and kills the outer cells, before entering the tissue, oxalic acid being readily demonstrated in the dead cells. Later the hyphae enter and produce a soft rot.

REINKING (O. A.) & WOLLENWEBER (H. W.). **Tropical Fusaria.** —*Philipp. Journ. of Science*, xxxii, 2, pp. 103–253, 6 pl. (2 col.), 47 figs., 1927.

A detailed account is given of the characters in pure culture of 48 kinds of *Fusarium* included in 37 species, which were isolated, by means of a technique which is described, from the soil and from living and dead bananas and other plants in the forests and plantations of Honduras and Guatemala. Of these, seven species, six varieties, and one form proved to be new. The majority of the species belonged to sections of the genus which contain parasites causing wilts, rots, and decays, and included *F. oxysporum* (potato wilt), *F. oxysporum* var. *nicotianae* (tobacco wilt), *F. cubense* (banana wilt), *F. aurantiacum* (wilt of Cucurbitaceae), and *F. bulbigenum* (wilt of bulbs). With the exception of *F. cubense*, the pathogenicity of the isolated strains has not been tested on their principal hosts; it is possible that they may be wild saprophytic forms of the proved parasites, capable of acquiring habits of parasitism after a more or less prolonged period of gradual adaptation [see also *R.A.M.*, v, p. 617].

A study of the various species in a particular section of the genus shows a gradual merging of one species into the next higher in the scale, the course of evolution being apparently from the small-spore to the larger-spore types. The same tendency is shown by different strains within the individual species; the 13 varieties included in 9 species of the section *Martiella* which were isolated show this evolution clearly. *F. oxysporum* var. *nicotianae* (which was not found to be pathogenic to varieties of the banana) connects *F. oxysporum* with *F. cubense* and might be placed in the latter species, which would include odorous and odourless saprophytic and parasitic forms [see also ibid., v, p. 767].

The authors state that it may be regarded as proved that *F. decemcellulare* Brick is the macroconidial form, and *Spicaria colorans* Van Hall de Jonge the microconidial stage, of *Calonectria rigidiuscula* (B. & Br.) Sacc.

RANGEL (E.). **Fungos do Brasil, novos ou mal conhecidos.** [Fungi of Brazil, new or little known.]—*Bol. Inst. Brasileiro Sciencias*, ii, 10, pp. 333–335, 1926. [Received March, 1927.]

Latin diagnoses are given of six new species of fungi from Brazil. Among these are *Pleosphaerulina colocasiae* on living and withering leaves of *Colocasia antiquorum*, and *Colletotrichum flacourtiae* on the unripe fruit of Madagascar plum (*Flacourtia ramonchii*).

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Iconografia de hongos parásitos y saprofitos de la República Dominicana. (Series 1–6).** [Collected pictures of parasitic and saprophytic fungi of the Dominican Republic (series 1 to 6).]—*Public. Estac. Agron. de Moca, República Dominicana*, Ser. B., Bot., 9, pp. 3–5, 13 pl., 1926. [Received April, 1927.]

The authors have republished separately the illustrations to the first six numbers of this series [*R.A.M.*, vi, p. 259]. In all, 37 new species of fungi are figured.

VERWOERD (L.). **'n Bydrae tot ons kennis van die Suid-Afrikaanse Ustilaginales of Brandswamme.** [A contribution to our knowledge of the South African Ustilaginaceae or Smut Fungi.]—*Ann. Univ. Stellenbosch*, Ser. A, iv, 2, 34 pp., 6 pl., 2 figs., 1926. [Received May, 1927.]

The author gives descriptions in Afrikander of 30 species of South African smuts of which material is available to him, mostly from the herbarium at Stellenbosch, and gives a further list of 20 South African species with which he is not acquainted. *Sorosporium simii* Pole Evans on *Andropogon halepense* is regarded as a synonym of *S. reilianum*.

TISDALE (W. B.) & KELLEY (J. G.). **Stem injury of Tobacco caused by fungi growing on the poison mixture used for controlling budworms.**—*Florida Agric. Exper. Stat. Bull.* 182, 8 pp., 6 figs., 1926. [Received April, 1927.]

A description is given of a diseased condition of the stems of cultivated tobacco which at first was noticed only sporadically in the Florida-Georgia tobacco area, but which in 1925 and 1926 appeared in epidemic form in several fields about a week or ten days after a slight rain following a dry period. The first sign of the trouble was a chlorotic mottling of the lower leaves, accompanied by a stunting of the entire plant. The affected plants developed on their stems at soil-level a dark brown to black lesion, varying from a half to over an inch in length and either remaining narrow or completely girdling the stems; in the latter case, especially when the lesion extended through the whole thickness of the cortex, the affected plants finally died. In advanced stages, the diseased tissue became dried and shrunken, giving the lesions a sunken appearance. Field examinations showed that all affected plants had a lump or crust of the poison mixture (maize meal and arsenate of lead), generally used in Florida for the control of budworms [*Heliothis virescens*], in direct contact with the injured parts. These lumps or crusts were overrun with fungi, which by isolations were found to be *Aspergillus oryzae*, *A. niger*, and a species each of *Mucor* and *Penicillium*. Symptoms of the disease were reproduced when pieces of pure cultures of the two species of *Aspergillus* were placed in direct contact with the stems of tobacco seedlings growing in sterilized soil in the greenhouse, and covered with a little soil, but inoculation experiments by inserting fragments of pure cultures of these fungi into the stems of the seedlings at soil-level gave negative results. It would therefore appear that the injury is of an indirect nature, perhaps due to substances produced by the fungi while growing on the maize meal. It is believed that the trouble may be effectively controlled by reducing the applications of the poison mixture to a minimum at each treatment, and by breaking up the soil around the stems so as to prevent the mixture accumulating at their base from coming into direct contact with the plants.

TISDALE (W. B.) & KELLEY (J. G.). **A Phytophthora disease of Tobacco.**—*Florida Agric. Exper. Stat. Bull.* 179, 61 pp., 27 figs., 1926. [Received April, 1927.]

This is a detailed account of the black shank disease of cultivated

tobacco which was described in 1922 by the senior author as gaining a rapid foothold in Gadsden County, Florida [*R.A.M.*, ii, p. 475]. Since then it has become common throughout the Florida-Georgia district, where it is now considered to be economically the most important tobacco disease and is making the cultivation of cigar wrapper tobacco hazardous; it has also been reported on shade tobacco in Pasco County, Florida, and from Virginia and Alabama. Primarily the disease is a dry rot of the roots and base of the stem, but the lower leaves are frequently attacked during the rainy season both in the field and in the curing sheds. The spread of the disease in the field is very rapid; many cases of total failure of the crop were observed in fields attacked for the first time.

Comparisons of pure cultures of the causal organism (the pathogenicity of which to tobacco was proved by exhaustive inoculation experiments and subsequent re-isolation) with *Phytophthora nicotianae* and *P. parasitica* showed that it possesses many characters in common with both species; it differs slightly from the former in morphological and physiological characters and from the latter most strikingly in its pathogenicity to tobacco, which *P. parasitica* could not be made to infect. It is therefore proposed tentatively to consider the Florida black shank organism as a biological strain of *P. nicotianae*. Under natural conditions it only attacks tobacco, but disease symptoms were produced in young seedlings of potato, eggplant (*Solanum melongena*), and castor (*Ricinus communis*) by artificial inoculation. When freshly cut potato tubers were planted in soil inoculated with the organism in the greenhouse, they decayed before sprouting, while no signs of rot were observed in potato seed-pieces planted in infected fields, this being ascribed to the low soil temperature prevailing at the time when they were planted.

The minimum temperature for growth of the fungus in culture is about 12° C., the optimum between 25° and 30°, and the maximum about 35°. The minimum temperature for the development of the disease in the field is below 20°, but the exact temperature was not determined. The organism is highly resistant to desiccation in the soil, as it survived 18 months when kept in air-dry soil. It is also known to persist for several years (up to five at least) in the soil of infected fields, possibly living as a saprophyte, since it has been found to grow readily on sterilized manure and to a less extent on sterile loam. It is killed by the fermentation process to which the leaves are subjected, and there was considerable evidence to indicate that it loses its vitality in diseased leaf tissues within the few days required for the leaves to dry out in the air.

The disease appears to be carried from field to field by dust, surface water, and by particles of soil adhering to the clothing of the labourers or to agricultural implements. No commercial control was obtained by the use of inoculated sulphur, semesan, uspulun, or land plaster under field conditions, although all these preparations inhibited the development of the disease for 36 days in greenhouse experiments. Partial control was obtained by steam sterilization of the soil, but this process was proved to be impracticable both because of its costliness and because of the great probability of re-infection within a short time.

All the commercial varieties of tobacco tested were found to be

highly susceptible at all stages of their growth. *Nicotiana rustica* was fairly resistant, but all efforts to make crosses between this variety and types of wrapper tobacco failed. Some progress was attained in the development of strains of Big Cuba tobacco resistant to black shank, but they are not yet considered to be sufficiently resistant to warrant their release for commercial growing.

TISDALE (W. B.). **Report of the Tobacco Experiment Station.**—*Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1926*, pp. 105R–111R, 1926. [Received April, 1927.]

The present report contains, besides information already noticed from other sources, the following items of interest. In an attempt to determine whether the tobacco wildfire organism (*Bacterium tabacum*) overwinters in the soil, experiments were made in two seed-beds, on one of which, situated on low, wet soil, infected plants had remained standing during the previous summer, and on the other, on high land, infected plants had been destroyed as they appeared. In the low-lying bed the first symptoms were observed early in March, and the disease continued to spread for about two weeks and then ceased with the onset of dry weather. No signs of wildfire were observed on the upland bed.

Two seed-beds were observed to be infected with blackfire [*Bact. angulatum*] early in the season. Several fields were planted with seedlings from these beds, but no signs of new infection were apparent a few weeks later, probably owing to the dry weather conditions after the plants were set.

PURDY (HELEN A.). **Multiplication of the virus of Tobacco mosaic in detached leaves.**—Abs. in *Phytopath.*, xvii, 1, p. 58, 1927.

The virus of tobacco mosaic, when inoculated into detached tobacco leaves, produces no macroscopic symptoms but causes the production of intracellular bodies similar to those associated with tobacco mosaic in the leaves of growing plants [*R.A.M.*, vi, p. 260]. The appearance of these bodies after a definite incubation period and their occurrence in tissues distant from the point of inoculation indicates a development of the virus in the cells of the detached leaves. The serial transmission experiments briefly described by the author supplied further evidence in favour of a multiplication of the virus in the cells of such leaves.

Verslag van het Deli Proefstation over 1 Januari 1926—31 December 1926. [Report of the Deli Experiment Station from 1st January, 1926, to 31st December, 1926.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, xlv, 36 pp., 1927.

The following references of phytopathological interest are contributed by Dr. S. C. J. Jochems to this report (pp. 11–16). Further investigations were made in connexion with the influence of soil humidity on the development of slime disease of tobacco [*Bacterium solanacearum*]. Infection was found to develop earlier with a rise in the degree of soil moisture, but it was not completely inhibited even when the latter was barely sufficient to keep the plants alive. The nature of the moisture supply, i. e., whether derived from

running or stagnant water, and other factors are also involved in the development of the disease.

Experimental seed-beds consisting of uninfected soil placed in concrete containers, open at the bottom, proved very satisfactory, but the construction of an apparatus suitable for the disinfection of large areas presents great difficulties. *Bact. solanacearum* was found to occur at a depth of 180 cm. below soil-level.

A new host of the slime disease organism was found in *Fleurya interrupta*, a very common plant in tobacco fields.

Disappointing results were given on the whole by further investigations on the development of resistant strains of tobacco [*R.A.M.*, iii, p. 747], but on two estates the progeny of R. 12 showed considerably less infection than the controls.

Stem rot of tobacco, caused by various species of *Pythium* [see next abstract], has been found to be most prevalent on low-lying, white clay soils. Shallow planting was found to decrease the incidence of infection.

All attempts to transmit mildew [? *Erysiphe cichoracearum*] from *Physalis minima* to tobacco gave negative results, and Miss Schwarz's conclusion (based on spore measurements) [ibid., v, p. 634] as to the identity of the organism on these two hosts is not accepted. The mosaic discoloration observed at Buitenzorg on plants affected by mildew is associated at Medan exclusively with mosaic disease [ibid., iii, p. 318].

Alangium begoniaefolium var. *tomentosum*, which is being grown as a timber for constructional purposes, was attacked by a species of *Catenula*.

JOCHEMS (S. C. J.). **Handleiding voor de herkenning en bestrijding van de ziekten van Deli-Tabak.** [Hints on the identification and control of the diseases of Deli Tobacco.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, xliii, 39 pp., 38 pl., 1926.

The writer gives a popular description of 7 parasitic, 2 virus, and 14 non-parasitic diseases of Deli tobacco in Sumatra, together with measures of control where these are known. In addition to slime disease (*Bacterium solanacearum*), seed-bed disease, (*Phytophthora nicotianae*), and mosaic, to which frequent references have been made in the pages of this *Review*, an account is given of black rust (*Bact. pseudozoogloeae*) [*R.A.M.*, i, p. 275], stem rot (*Pythium* spp.) [ibid., iv, p. 595], *Sclerotium* disease (*S. rolfsii*), cobweb disease (*Rhizoctonia solani*) [ibid., vi, p. 4], frog-eye (*Cercospora nicotianae*), and Rotterdam B disease. The last is a new virus disease named after the plantation in Lower Deli where it was first noticed. The earliest symptoms appear on the youngest leaves as scattered, indefinite, light green or yellow areas in which irregular, dead, brown spots, up to 5 mm. in diameter and either sharply limited by, or elongated along, the veins, develop after one or two days. The leaves become blistered, show irregular margins, turn yellow, and hang down. Sooner or later the midribs and main veins become black and shrunken in parts of their course, while the stems below affected leaves are blackened externally and internally. Sap expressed from affected plants, passed through a bacterial filter and introduced into the tops of the stems of healthy tobacco

plants, gave rise to the characteristic symptoms, which resulted in the death of the plants in ten days.

Black rust is characterized by the appearance on the leaves of dark green spots, which soon turn brown and show numerous dark brown or black concentric rings; they are one to two cm. in diameter, or more when they run together. Sometimes a great part of the leaf margin is affected. The spots are bounded by a dark green ring, which in damp weather gradually shades into the healthy tissues, but is sharply defined in dry. Even on dry days, the spots remain moist for a considerable time in the morning.

This disease causes little damage and control is not usually required. In bad cases the affected leaves should be removed and burnt.

Stem rot or stem scorch is said to be caused by several species of *Pythium*, including *P. de Baryanum*, *P. aphanidermatum*, and some others. In its most typical form it appears soon after the seedlings are transplanted in the field. The stems of affected young plants become much shrunken for a short distance above and below the ground level, rot, and fall over or break off. When the stem is more woody the shrinkage affects only the cortex and results in a broad depression of the surface, somewhat like that caused by *R. solani* or *S. rolfsii*. The tissues below this depression are jet black down to the wood. The pith is usually destroyed and shows the same chambering (division of the cavity by disks of tissues) as is found in plants attacked by *P. nicotianae*. In very mild attacks there may be only a few dark stripes on the stem. There is often a loose cottony growth of mycelium around the base of the stem, especially below the ground level. Strong-stemmed plants only show a wilting of the above-ground parts without falling over.

Infection occurs from a few days after transplanting to a few days after full growth, and has also been seen, though seldom, in the seed-beds, where the leaves may also be attacked. When the weather is dry during transplanting there is little stem scorch, but in wet weather, especially when the field has had *Leucaena glauca* or *Phytolacca octandra* as a green manure or cover crop [*R.A.M.*, iv, p. 595], severe attacks may occur. On this account the use of these plants in susceptible tobacco fields should be abandoned. In such cases also it is recommended to have special seed-beds which are left for, say, five days longer than normal in order to provide seedlings with more woody stems for supplying the gaps caused by the disease shortly after transplanting. These beds should not be watered for some time before their seedlings are used, as this helps to make the plants more woody. In transplanting, the seedlings should be planted down to the collar only, since the stem is the most susceptible part.

Of the 14 non-parasitic diseases and abnormalities described, only the cause of those due to potash and magnesia deficiency and storm damage is known, but red rust and top-rot are alone of economic importance.

JOCHEMS (J. S. C.). **Bestrijding van stengelverbranding bij Deli Tabak.** [Control of stem scorch in Deli Tobacco.]—*Deli Proefstat. te Medan-Sumatra Vlugschr.* 39, 3 pp., 1927.

The results of three field experiments, carried out in 1926 and

1927, showed that stem scorch of Deli tobacco (*Pythium* spp.) [see preceding abstract] can be controlled by the use of old woody seedlings (the most susceptible period being five to ten days after transplanting), by shallow planting, and by leaving the plant-holes open for eight to ten days after transplanting. The seedlings were placed in the holes so that only the roots were covered, watered enough to secure growth but no more, and the earth was not drawn up around the plants until after eight or ten days. The percentage of infection was reduced from 23·1, 37, and 44·2 where ordinary young seedlings planted in the usual way were used, to 0·4, 0·6, and 5·1, respectively, when the above methods were adopted, in the three tests.

SPAULDING (P.). **A serious disease of Birches.**—Abs. in *Phytopath.*, xvii, 1, p. 59, 1927.

Observations by the author lead him to conclude that a disease found in the summer of 1926 on *Betula lutea* in Vermont and on *B. lenta* in Massachusetts was caused by a *Nectria*. He does not exclude as a cause of serious injury the bronze birch borer to which foresters have attributed the increasingly decrepit condition of yellow birch in these areas during the last few years.

BOYCE (J. S.). **Observations on forest pathology in Great Britain and Denmark.**—*Phytopath.*, xvii, 1, pp. 1–18, 1927.

In this paper the writer describes the results of his observations, made during 1925, on the pathological conditions of various conifers introduced into Great Britain and Denmark, especially those from the western United States. Some general remarks are also made on the intensive methods of reafforestation which have been adopted in England and Scotland since the great war.

The widely grown Douglas fir (*Pseudotsuga taxifolia*) is attacked both in Great Britain and Denmark by canker (*Phomopsis pseudotsugae*) [*R.A.M.*, v, p. 259], the symptoms of which are described, with notes on the synonymy of the fungus. Near Murthly, Scotland, a plantation was reduced by some 50 per cent. by the attack of 1920–22. On the Japanese larch (*Larix leptolepis*), the cankers are less common, though larger, than on Douglas firs and were not observed to kill the trees. *P. pseudotsugae* was also collected by the writer from Douglas firs on the island of Bornholm, Denmark. Attention is drawn to the risk of introducing this formidable disease into the United States, where it is not known, since Douglas fir comprises one-quarter of all the merchantable timber of that country.

Silver firs (*Abies pectinata*) are severely attacked in Scotland by *Rehmiellopsis bohemica* [ibid., iv, p. 198], which also occurred in epidemic form on Bornholm in 1924. The only American species found infected in Scotland was *A. nobilis*.

Swiss stone pines (*Pinus cembra*) up to 25 years old were heavily attacked in one locality in Scotland by *Brunchorstia destruens* (*Cenangium abietis*) [ibid., vi, pp. 196, 264]. Swiss mountain pine (*P. montana*), western white pine (*P. monticola*), and lodgepole pine (*P. contorta*) on poor sites were also infected. On another

estate Corsican pines (*P. laricio*) were suffering severely from the same fungus.

The planting of five-needled pines is stated to have been definitely abandoned in Great Britain on account of white pine blister rust (*Cronartium ribicola*), the uredo-teleuto stages of which were abundant in places on cultivated black currants (*Ribes nigrum*). Eastern white pines (*P. strobus*) on Bornholm were heavily damaged by blister rust [ibid., vi, p. 327], the nearest source of infection being black currants in farm gardens at distances of 300 to 3,300 ft. from the trees. No difference in the degree of infection was apparent as the distance from the currants increased. *R. nigrum* should be entirely excluded from all regions where white pines are grown.

The incidence of *Dasyscypha calycina* on larch (*Larix europaea*) in Great Britain is stated to be decreasing as a result of improved sylvicultural methods.

Leaf blight of western red cedar (*Thuja plicata*), caused by *Keithia thujina*, has been reported of recent years from a number of widely separated points in England, Scotland, and Ireland [ibid., ii, p. 348]. The fungus, which is evidently capable of causing severe damage, is believed to have been introduced from America.

Root rot, caused by *Armillaria mellea*, was found to be prevalent on all species of conifers in cleared areas formerly occupied by old oaks [ibid., vi, pp. 197, 198], Corsican pines being particularly susceptible. In the Pacific Northwest *Fomes annosus* mostly occurs on mature trees or old stumps, whereas in Europe saplings of Norway spruce (*Picea excelsa*), Douglas fir, and silver fir are mainly affected by this fungus.

Yellow leaf blister rust (*Taphrina aurea*) was observed in a Scotch nursery on saplings of *Populus generosa*, *P. laurifolia*, and *P. nigra*, the last-named being most severely infected. *P. trichocarpa*, which is susceptible to the rust in the Pacific Northwest, remained free from infection, though in close proximity to diseased individuals.

The author's observations have convinced him of the existence of biological strains within certain species of forest fungi occurring in Europe and America, the polymorphism of which has been little investigated. There would also appear to be a pathological as well as a morphological basis for the British differentiation of the Douglas fir into two species, namely, *Pseudotsuga douglasii* and *P. glauca*.

In the course of some general observations on quarantine protection, it is pointed out that the isolated position of Great Britain affords a good opportunity for the exclusion of foreign parasites. This has been largely lost, in the case of the forests, by the unrestricted importation of young trees.

Sale of Diseased Plants Order of 1927.—Statutory Rules and Orders, 1927, No. 350, 4 pp., 1927.

This Order, dated 22nd April, and effective as from 25th March, 1927, supersedes Orders No. 1465 of 1919 and No. 582 of 1922 under the Destructive Insects and Pests Acts, England. It

prohibits the sale in England and Wales of any fruit trees substantially attacked by parasitic fungous cankers; American gooseberry mildew (*Sphaerotheca mors-uvae*); or silver leaf (*Stereum purpureum*); and likewise of potatoes infected by powdery scab (*Spongospora subterranea*). Failure to comply with any of the regulations of this Order renders the offender liable to a penalty not exceeding ten pounds.

Federated Malay States. Enactment No. 30 of 1926.—Supplement to *Federated Malay States Government Gazette*, Notification No. 883, xix, 3, 10 pp., 11th February, 1927.

This is the full text of the enactment, dated 17th January, 1927, to consolidate and amend the law relating to the protection of trees, plants, and cultivated products against disease and pests in the Federated Malay States. The enactment, which may be cited as the Agricultural Pests Enactment, 1926, came into force on the date of its publication in the *Gazette*. It provides for the inspection of land and premises by officers who may order the destruction or treatment of diseased plants or the treatment of land; they may also place the land in quarantine under certain prescribed conditions. Appeal against the decisions of the Inspecting Officer may be made to the Supervising Committee, consisting of three persons nominated by the Chief Secretary. Particulars concerning penalties for non-compliance, compensation of owners for expense incurred, and other regulations are given.

Law and regulations concerning the Plant Quarantine Service in Japan.—Imperial Plant Quarantine Service, Yokohama, Japan, 31 pp., 8 diags., 1926. [Received May, 1927.]

This is the text of the Plant Quarantine Law of Japan, which came into force on 1st November, 1914, and of the regulations thereunder. Particulars are given of the mode of application for inspection and other details of the routine to be adopted, together with notices and copies of the forms required in regard to (*a*) the importation and reception of certain plants and packing material (13th August, 1920); (*b*) the inspection of plants to be exported to certain specified foreign countries (8th February, 1926); and (*c*) inspection of plants to be exported to Chosen [Korea] (27th August, 1919).

Outline of the Plant Quarantine Service of Japan.—Imperial Plant Quarantine Service, Yokohama, Japan, 18 pp., 1 map, 1926. [Received May, 1927.]

The history of the Plant Quarantine service of Japan is briefly traced from its inception in 1914 with the promulgation of the Plant Quarantine Law [see preceding abstract]. Particulars are given of the organization and work of the service, and some interesting information is supplied concerning the diseases and pests found in the shipments destined for export to foreign countries as well as in those imported from abroad. Statistical tables show the number of shipments imported and exported from 1915 to 1924, and lists are given of the kinds of plants requiring inspection, and of the seaports where this work is carried out.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

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RAMSEY (G. B.) & BAILEY (ALICE A.). **The development of nailhead spot of Tomatoes during transit.**—Abs. in *Phytopath.*, xvii, 1, p. 43, 1927.

A study has been made during the past two seasons of the development during transit and marketing of nailhead spot of tomatoes [*Macrosporium tomato*: *R.A.M.*, v, p. 598], a disease which has caused much damage in Florida in this phase as well as in the field. The diameter of all spots on mature green tomatoes selected at the packing house was measured prior to wrapping and packing and again on arrival at Chicago. The average increases in diameter after $6\frac{1}{4}$ days in transit are recorded in tabular form.

ECKERSON (SOPHIA H.) & KRAYBILL (H. R.). **Separation of fern leaf from mottling in Tomato mosaic.**—Abs. in *Phytopath.*, xvii, 1, pp. 57-58, 1927.

By filtering juice from mosaic tomato plants through sintered glass filters having pores about 4 μ in diameter and through collodion membranes, it was possible to separate the juice into two fractions, the residue containing the infectious principle (probably, the writers think, an organism) which produces typical tomato mosaic, and the filtrate, a non-infectious principle (stated to be possibly of the nature of toxins) which passes through collodion membranes and produces only fern-leaf and filiform symptoms, with no mottling. Attempts to infect other plants with the juice of plants showing only the fern-leaf symptoms failed.

BOYCE (J. S.). **Diseases of commercially important conifers in the Pacific Northwest.**—Office of Investigations in Forest Pathology, Bureau of Plant Industry, 37 pp., reissued 1926. [Mimeographed.]

This survey of the diseases of commercially important conifers in

the Pacific Northwest, originally issued in 1923 in *U.S. Forest Service Study Course, District 6, Course V*, is a compilation from the publications of Meinecke, Weir, and the present author. It contains an introductory portion dealing with the general structure and functions of trees, and with disease, its cause, symptoms, and detection. The main part of the paper, however, is concerned with particular diseases affecting certain trees. The species considered and the fungi attacking them are as follows: Douglas fir [*Pseudotsuga taxifolia*], *Trametes pini, Polyporus schweinitzii, Fomes laricis, F. roseus, Rhabdocline pseudotsugae, Phomopsis pseudotsugae*; western hemlock [*Tsuga heterophylla*], *Echinodontium tinctorium*; Sitka spruce [*Picea sitchensis*], *F. pinicola, Lophodermium* sp., *Melampsoropsis ledicola*; balsam firs (*Abies* spp.), *E. tinctorium, Polyporus sulphureus, Hypodermella abietis-concoloris, Hypoderma robustum, Melampsorella elatina*, and needle rust caused by several species of the Uredinaceae; western red cedar [*Thuja plicata*], *Poria weirii, Keithia thujina*; incense cedar [*Libocedrus decurrens*], *Polyporus amarus, Gymnosporangium blasdaleanum*; western larch [*Larix occidentalis*], *F. laricis, Trametes pini, P. schweinitzii, Hypodermella laricis*; western yellow pine [*Pinus ponderosa*], *T. pini, F. laricis, P. schweinitzii, Lophodermium pinastri, Hypoderma deformans, Cronartium harknessii*; sugar pine [*P. lambertiana*], *C. ribicola*; lodgepole pine [*P. contorta* var. *murrayana*], *T. pini, F. laricis, P. schweinitzii, C. harknessii*; western white pine [*P. monticola*], *T. pini, P. schweinitzii, F. annosus, C. ribicola.* In each case the symptoms, methods of detection, amount and nature of the damage, and method of infection are dealt with.

The paper concludes with a section on disease control.

WIANT (J. S.). **Soil treatment for the control of damping-off in coniferous seed-beds.**—Abs. in *Phytopath.*, xvii, 1, pp. 51–52, 1927.

In experiments conducted in 1926 at Keene, New Hampshire, in which *Rhizoctonia* [*Corticium*] *solani* was the chief pathogen involved, effective control of damping-off was secured in beds of *Pinus strobus* and *Picea excelsa* with chlorophenol-mercury (semesan and uspulun), mercuric chloride, and nitrophenol-mercury (Bayer compound), and in beds of *Pinus resinosa* with aluminium sulphate, uspulun, mercuric chloride, Bayer compound, and sulphuric acid. Three organic mercury dusts of the Bayer Company, under the numbers 1–8, 101, and 112, gave significant increases over untreated beds in the final stand of *P. resinosa*, but were slightly less valuable in beds of *P. sylvestris* and *Picea excelsa.* Powdered copper carbonate, applied at the rate of 4 to 8 gm. per sq. ft., produced severe chemical injury.

DELEVOY (G.). **La fonte des semis ou 'damping off'.** [The melting or damping-off of seedlings.]—Reprinted from *Bull. Soc. Centr. Forest. Belgique*, 24 pp., 2 figs., 1926. [Received May, 1927.]

This account of damping-off of conifer seedlings is based partly on Hartley's investigations (*U.S. Dept. of Agric. Bull.* 934)

[1921] and in part on the writer's personal observations at Groenendael, Belgium, where the damage appears to be mainly due to undetermined species of *Fusarium* and to *Corticium vagum* [*C. solani*: *R.A.M.*, v, p. 61]. The seedlings are attacked immediately on germination, frequently withering and collapsing on emergence from the soil. The root system often fails to develop, being replaced by a discoloured stump. In milder cases the plants may be saved by the development of adventitious rootlets. The period of activity of the fungus seems to range from the early spring to the end of June or beginning of July. The attack develops sporadically but the infected areas gradually extend and unite.

The disease has been observed on the following species at Groenendael: *Pinus sylvestris*, *P. laricio*, *Picea excelsa*, *Pseudotsuga douglasii* [*P. taxifolia*], *Abies pectinata*, *A. numidica*, *A. cephalonica*, *Picea omorica*, *P. nigra*, *Thuja gigantea*, *Chamaecyparis lawsoniana*, *Tsuga mertensiana*, *Larix europaea*, *Cedrus libani*, and *C. atlantica*. Varietal susceptibility appears to depend greatly on local conditions. At Groenendael pines in general and *P. laricio* in particular are highly susceptible, pines from Corsica being more severely attacked than those from Austria or Calabria. *P. contorta*, *Pseudotsuga taxifolia*, *Picea excelsa*, and *L. leptolepis* are also very susceptible, while the above-mentioned species of *Abies* and *Cedrus* and the Cupressineae are resistant.

The method of sowing appears to exert some influence on the incidence of damping-off. The best results in 1925 were given by Hacker's machine, the seed being sown in rows 6 cm. apart at the rate of 2 kg. per are in the case of *Pinus sylvestris* and *Picea* spp. and 1·5 kg. in that of *Chamaecyparis lawsoniana*. Early sowing (first half of May) greatly reduced the incidence of infection in *Pseudotsuga taxifolia*, *Pinus sylvestris*, and *P. laricio*, but in general the date of sowing appears to be of secondary importance.

Immersion of the seed in 5 per cent. permanganate of potash for 24 hours gave beneficial results in the case of *Pinus sylvestris* and *Picea* spp., the stand from treated seed being three or four times as large as that from the untreated. The most promising method of control, however, appears to be disinfection of the soil, 8 to 15 days before sowing, with permanganate of potash (5 gm. per sq. m.), formalin (100 c.c. per sq. m.), or nitrate of soda (20 gm. per sq. m.). Lysol is efficacious but should be used with extreme care at a rate of less than 4 l. per sq. m. for a 10 per cent. solution. Sulphuric acid gave good control of damping-off but adversely affected the plants and the soil. Generally speaking, curative measures appear to be of little value, but spraying with permanganate of potash (0·5 per cent.) at the rate of 5 l. per sq. m. may occasionally be useful.

The best covering for the seeds was found to be a layer of sawdust, 1 cm. in depth, while coarse sand was also effective. The type of shelter is also of some importance, straw matting placed horizontally at a height of 50 cm. above soil-level being preferable for *Pseudotsuga taxifolia*, while vertical windbreaks, 1·25 m. in height and 1·25 m. apart, have been found most effective for the other species discussed.

C. (H. G.). **The damping-off of tree seedlings.**—*Indian Forester*, liii, 2, pp. 101–103, 1927.

In the course of a brief review of Delevoy's work on the damping-off of conifer seedlings in Belgium [see preceding abstract] the writer states that serious losses from this disease have recently occurred in *Pinus longifolia* stands at Dehra Dun, India. Attempts to raise exotic pines, e.g., *P. insignis*, and other kinds of trees frequently fail on account of infection by *Pythium*, *Corticium* [*solani*], and occasionally by *Phoma* spp. Successful control appears to depend so greatly on environmental and other variable conditions that general conclusions are not yet applicable.

HAGEM (O.). **Schütteskader paa Furuen. (Pinus silvestris).** [Damage to the Scotch Pine (*Pinus sylvestris*) from leaf fall.] —*Vestlandets Forstl. Forsøksstat. Meddel.* 7, 133 pp., 1 graph, 1926.

In this paper the author presents the results of his extensive researches (based on personal observation as well as on the work of previous investigators) into the nature and etiology of the leaf fall disease of Scotch pine (*Pinus sylvestris*) in the coastal districts of western Norway.

Most of the damage appears to be due to infection by *Lophodermium pinastri* [*R.A.M.*, v, p. 708], which is specially prevalent after cold, wet summers, such as those of 1921, 1922, and 1923. The life-history of the fungus is fully described, with special reference to its dependence on meteorological and climatic conditions in Norway and elsewhere. Meteorological factors, including wind scorch (to which leaf fall is commonly attributed), are thought to be of secondary importance, except in so far as they weaken the trees and predispose them to the attacks of insect and fungous parasites. *P. sylvestris* requires an abundant water supply and should be deeply planted in sheltered situations. A number of silvicultural recommendations and many local observations are given. A bibliography of 83 titles is appended, and numerous citations from the literature are scattered through the paper.

DEMORLAINE (J.). **La grande misère du Chêne dans nos forêts françaises.** [The wretched state of the Oak in French forests.]—*Rev. Eaux et Forêts*, lxv, 1, pp. 1–3, 1927.

The author imputes the gradual disappearance of the oak from French forests in part to stocking with pure oak (*Quercus pedunculata*) in part to repeated attacks of *Oidium* [*Microsphaera quercina*], as well as to caterpillar invasions and frequent spring frosts. Thinning in the pure oak groves in the Forêt de Compiègne between 1919 and 1923, however, has resulted in dying oaks acquiring new life, notwithstanding attacks by *Oidium*. He recommends that after the removal of dead oaks, the plantations should be reconstituted with conifers, and the oak only reintroduced after some years, preference being given to the English oak (*Q. robur*) not to *Q. pedunculata*. The American red oak (*Q. rubra*) might also be introduced, since it is especially resistant to mildew.

HECK. **Muss man die Hexenbesen der Weisstanne verfolgen?** [Must steps be taken to exterminate the witches' brooms of the Silver Fir?]—*Forstwissensch. Centralbl.*, xlix, 4, pp. 132–140, 1927.

The writer's extensive experience as a forester in the Stuttgart district has convinced him that the excision of the witches' brooms produced by *Aecidium elatinum* [*Melampsorella caryophyllacearum*] is useless for the control of canker in the silver fir [*Abies pectinata*]. The disease can be sufficiently controlled for all practical purposes by the removal of trunks with infected shafts, and the occurrence of witches' brooms may safely be disregarded as of no economic importance.

FALCK (R.) & HAAG (W.). **Der Lignin- und der Cellulose-Abbau des Holzes, zwei verschiedene Zersetzungsprozesse durch holz-bewohnende Fadenpilze.** [Decomposition of lignin and cellulose: two distinct disintegration processes by wood-inhabiting Hyphomycetes.]—*Ber. Deutsch. Chem. Gesellsch.*, lx, 1, pp. 225–232, 3 graphs, 1927.

A distinction is drawn between two types of decay caused by wood-inhabiting fungi, namely, a 'corrosion' type in which lignin is partially destroyed and cellulose only slightly affected; and a 'destruction' type, characterized by the almost complete destruction of cellulose while the lignin remains intact. Detailed analyses are presented in tabular form of the two types as represented by pine wood rotted by *Polyporus* [*Fomes*] *annosus* and *Merulius domesticus* [*M. lacrymans*], respectively. Specific gravity decreases more in the corrosion than in the destruction form of decay; there is an increase of ash and a decrease of pentosans in both; the percentage by weight of cellulose in the first type decreased from 56·00 to 48·20, and in the second from 44·00 to 7·80, while that of lignin decreased from 23·55 to 15·10 in the corrosion and increased from 24·60 to 56·58 in the destruction type.

CAMPION (W. E.). **Bark-rot in 'Eucalyptus ficifolia'.**—*Australian Forestry Journ.*, x, 1, pp. 16–17, 2 figs., 1927.

Cases of bark rot of a type stated to be common in some English trees but not hitherto reported in *Eucalyptus* occurred in an avenue of *E. ficifolia* trees in Western Australia. As a result of free pruning, particularly upon small lateral branches which had been cut off close to the main branches or stem, rotting bacteria and fungi penetrated and spread through the bark of the parent branches, ringing them and causing their death. Much of the damage was caused by pruning in the late autumn, when the stumps had no time to harden and heal before the wet season set in. Pruning of eucalyptus trees is stated to be unnecessary, since they prune themselves naturally, and it is advised that lopping, where unavoidable, should be done in January, or as soon after the flowering period as possible, and that the wounds should be tarred.

FARSKÝ (O.). **Příspěvek k ochraně proti hlence Kapustové.** [Notes on the control of club-root of Cabbage.]—*Ochrana Rostlin*, vi, 5–6, pp. 114–118, 1926.

After stressing the economic importance of the cabbage club-root disease (*Plasmodiophora brassicae*) in Czecho-Slovakia, where most of the soil in small holdings and commercial vegetable gardens is stated to be infected with the organism, the author enumerates the usual recommendations for its control, such as strict sanitation of the soil; crop rotation where possible; avoidance of organic manure; application of alkaline fertilizers, such as slaked lime, basic slag, or kainit; disinfection of the seed; and sterilization of the soil of the seed-beds. As an example of the efficacy of these measures, the case is cited of a grower who succeeded, under the author's guidance, in reducing the incidence of the disease on his fields from almost 100 per cent. in 1923 to a negligible amount in 1926, the method followed by him being described at length.

BRÖNNLE (H.). **Kohlhernie-Bekämpfungs-Versuch in Stade 1926.** [Control tests of club-root of Cabbage at Stade in 1926.]—*Obst- und Gemüsebau*, lxxii, 24, p. 358, 1926.

In these experiments to test the efficacy of uspulun against club-root of cabbage [*Plasmodiophora brassicae*] seed of common and red cabbage was immersed for half an hour in 0·5 per cent. uspulun, and sown on 22nd March, 1926, in a moderately warm forcing-bed which had been watered a few days previously with a similar uspulun solution. At the end of April the seedlings were transferred to an open bed, the infected soil of which had been watered with a stronger solution of uspulun. On 17th May, half of the little plots in which the plants were to be set out (which had been heavily infected in 1924) were treated with a thick mixture of loam, cow-dung, and 2 gm. of uspulun to 1 l. of water, which was poured into the planting holes, and the next day, when this had soaked in, planting out was effected.

At first the plants in the treated plots grew far more slowly than the untreated ones, but they overtook the latter in the course of the summer. Of the two varieties tested, Heinemann's Juni-Riesen gave, out of 26 plants, 6 badly infected and 15 slightly infected for the treated, whilst the same number of untreated gave 19 and 6, respectively. The corresponding figures for Erfurter frühester blutroter Salat were 8, 15, 23, and 2 respectively. These results confirm those obtained in similar tests the year before.

DAVIS (W. H.). **Cercosporella leafspot of Chinese Cabbage.**—Abs. in *Phytopath.*, xvii, 1, p. 42, 1927.

An organism which is identified as *Cercosporella* (*Cercospora*) *albo-maculans* E. and Ev., was found to cause a leaf spot on Chinese cabbage [*Brassica pekinensis*] in Massachusetts, the characteristic symptom of which was the formation of circular lesions with paper-white centres crossed by dark brown veinlets. There were two types of mycelium, the hyphae in living tissues measuring 2 μ and those in dead tissues 5 μ in diameter. Sclerotium-like bodies, producing hyaline conidiophores measuring 10 to

13 by 3 μ, were located in the lesions directly beneath the dead epidermal cells. The conidia were hyaline, elongate-cylindrical, curved, with 0 to 5 septa, 56 by 2·5 μ, and germinated with difficulty. Parsnips, beets, carrots, celery, common cabbage, and Chinese cabbage were inoculated with conidia from Chinese cabbage, all except the last-named remaining healthy.

KENDRICK (J. B.). **Radish black-root caused by Aphanomyces raphani n. sp.**—Abs. in *Phytopath.*, xvii, 1, p. 43, 1927.

The writer states that *Aphanomyces raphani* n. sp., which causes the black root disease of radish [*R.A.M.*, iv, p. 83], resembles *A. euteiches* in its oogonia and oospores, but differs from both *A. euteiches* and *A. levis* de Bary in that the tapering portions of its zoosporangia, from which the zoospores escape, show spiral twisting, and the diameter of its vegetative hyphae is much greater. The mycelium is intercellular and the diseased tissues are killed but remain firm unless invaded by rot-producing organisms. The optimum temperature for the fungus is 23° to 27° C. The disease is more severe on the long than on the round type of radishes, owing to the distribution of the natural wounds made by the emergence of secondary roots from the primary root, which serve as points of infection. *Pythium aphanidermatum*, to which the disease was formerly attributed [loc. cit.], was not found capable of infecting radishes.

MCKAY (M. B.) & DYKSTRA (T. P.). **Sugar-beet curly-top virus, the cause of western Tomato blight.**—Abs. in *Phytopath.*, xvii, 1, p. 39, 1927.

By placing virulent leafhoppers (*Eutettix tenella*) from curly top beets on healthy tomato plants in a greenhouse, the writers induced the plants to develop typical symptoms of western yellow blight [*R.A.M.*, v, p. 59; vi, p. 382]. After an incubation period of from two to three weeks, the symptoms developed were comparable to those frequently observed in the field. General yellowing of the foliage, rotting of the leaves, purpling of the veins, and marked stunting of the plant occurred. Some of the same leafhoppers which transmitted the disease to tomatoes also carried curly top to sugar beets. All the untreated controls remained healthy.

MCKAY (M. B.) & DYKSTRA (T. P.). **Curly-top of Squash.**—Abs. in *Phytopath.*, xvii, 1, pp. 48–49, 1927.

The authors describe the symptoms of a severe disease, not previously observed, found in August of this year in Oregon, Washington, and Idaho on several varieties of squashes [*Cucurbita* spp.]. Circumstantial evidence suggested that the disease was due to the virus of the sugar beet curly top disease, and it was readily produced in the greenhouse by the use of infective leafhoppers (*Eutettix tenella*) from curly top beet plants [see also preceding abstract]. Individual leafhoppers which induced curly top on squash also caused curly top on sugar beet. Untreated controls remained healthy.

JONES (L. K.). **The relation of Mycosphaerella pinodes to Ascochyta blight of Peas.**—Abs. in *Phytopath.*, xvii, 1, p. 44, 1927.

The writer briefly refers to two closely associated species of *Ascochyta*, capable of producing distinct diseases of pea plants, and carried frequently in the seed. Pycnospore measurements of the two species were similar and fell within the range given for *Ascochyta pisi* Lib. One organism produced its ascigerous stage on culture media and on the host, the morphological characters of this stage being similar to those described for *Mycosphaerella pinodes*, the host and cultural relations, however, differing markedly from those of *A. pisi*. Mature perithecia were found on pea plants twenty-five days and on culture media fifteen days after inoculation. This organism produced a serious brown to black basal stem rot of peas and indefinite, uniformly purplish-brown foliage lesions. The other organism produced host reactions as described for *A. pisi*, but the ascigerous stage could not be traced. The writer concludes that the two organisms have been confused and that *M. pinodes* is not the ascigerous stage of *A. pisi*.

BREDEMANN (G.) & TEN DOORNKAT-KOOLMAN (H.). **Zur Immunitätszüchtung bei Phaseolus vulgaris gegenüber Colletotrichum lindemuthianum und seinen Biotypen.** [On the breeding of *Phaseolus vulgaris* for immunity from *Colletotrichum lindemuthianum* and its biotypes.]—*Zeitschr. für Pflanzenzüchtung*, xii, 2, pp. 209–217, 1927.

Schaffnit and Böning have shown [*R.A.M.*, iv, p. 458] that seed treatment and other prophylactic measures are of relatively little value in the control of severe attacks of anthracnose of beans (*Colletotrichum lindemuthianum*). A study of the practical possibilities of breeding immune varieties has been in progress at the Landsberg [Brandenburg] Plant Breeding Institute since 1921.

Two important points formed the basis of the researches, namely, the mode of inheritance of the characters for resistance to anthracnose, and the possibility of the existence in Germany and elsewhere of biological strains of *C. lindemuthianum* [ibid., vi, p. 322]. Attention was further paid to the inheritance of various qualities of commercial importance, e. g., fruit and seed colour, and habit of growth, the tall, erect types of *Phaseolus vulgaris* and the scarlet runner (*P. multiflorus*) enjoying a mechanical protection from disease due to their elevation above soil-level.

Hybrids between bean varieties and species of varying degrees of susceptibility and resistance were made as follows: (1, varietal crosses) bush beans (*P. vulgaris* var. *nanus*) × bush beans and bush beans × runner beans (*P. vulgaris* var. *communis*) and reciprocally, and (2, specific crosses) bush beans × scarlet runners (red- and white-flowering varieties).

Tests of immunity were made by inoculations in the moist chamber on the ripe pods with conidial suspensions of the fungus, and also on young seedlings in the greenhouse. Both methods gave similar results but the latter was found to be the more reliable.

Crosses between pure-line susceptible varieties of *P. vulgaris*

produced only susceptible progeny, when tested against a single strain of *C. lindemuthianum*. Similarly in the case of resistant crosses the progeny was only resistant. Crosses between (1) susceptible × somewhat resistant and susceptible × resistant and vice versa; (2) somewhat resistant × somewhat resistant; and (3) somewhat resistant × resistant or vice versa mostly showed transgressive segregation from susceptible to very resistant. Grouping the grades of susceptibility as follows: (1) more resistant than susceptible + resistant + highly resistant on the one side and (2) highly susceptible + susceptible + more susceptible than resistant on the other, the monohybrid segregation ratio 3 : 1 could often be approximately established. The transgression of susceptibility in the F_2 generation of these hybrids within the species *P. vulgaris* agrees with the view of Hammarlund, who attributed the phenomenon to polymeric hereditary factors [ibid., iv, p. 432]. Resistance was always dominant.

In crosses between susceptible varieties of *P. vulgaris* and immune ones of *P. multiflorus*, the susceptibility segregation showed a less marked transgression and also a distinct recurrence of the character for immunity innate in *P. multiflorus*.

It is therefore apparent that bush beans highly immune from certain definite biological strains of *C. lindemuthianum* can be developed by the selection of suitable parents. The progeny of semi-resistant varieties may be expected to show greater resistance than their parents, the selection of which is thereby greatly simplified. But it will be a long and difficult task to produce varieties resistant to all the strains of the parasite to which they are likely to be exposed.

In the author's hybridization experiments with *P. vulgaris* and *P. multiflorus*, individuals of the F_2, F_3, and F_4 generations, inoculated with a mixture of all the available biological strains of *C. lindemuthianum*, exhibited the resistance peculiar to *P. multiflorus* in a number of cases. These results are regarded as promising from the standpoint of breeding varieties combining the resistance of *P. multiflorus* with the desirable qualities of *P. vulgaris*.

WEBER (G. F.). **Diseases of Cucumbers.**—*Florida Agric. Exper. Stat. Bull.* 177, 44 pp., 33 figs., 1925. [Received April, 1927.]

The scope of the present bulletin is to supply the cucumber growers of Florida with information regarding diseases of this crop, which is said to be one of the leading truck crops of the State. Among the most serious diseases are included downy mildew (*Pseudoperonospora cubensis*) [*R.A.M.*, ii, p. 382]; anthracnose (*Colletotrichum lagenarium*); and angular leaf spot (*Bacterium lacrymans*). Those of less commercial importance are mosaic; bacterial wilt (*Bacillus tracheiphilus*); black rot of the fruit (*Mycosphaerella citrullina*); stem rot (*Sclerotinia sclerotiorum*); powdery mildew (*Erysiphe cichoracearum*); southern blight (*Sclerotium rolfsii*); wilt (*Fusarium cucurbitae*); and leaf blight (*Macrosporium cucumerinum*). Control measures are indicated in the case of each disease, and the paper terminates by a description of some fungicides and their application.

ELMER (O. H.). **A mosaic resistant variety of Cucumbers.**—Abs. in *Phytopath.*, xvii, 1, p. 48, 1927.

Mosaic inoculation tests conducted in the greenhouse resulted in no infection in Chinese Long, a cucumber variety obtained from Nanking, China, while approximately 100 per cent. infection occurred in the White Spine variety. In a field plot, aphids transferred from mosaic cantaloupe plants failed to induce infection in the first-named variety.

PORTER (D. R.). **Watermelon wilt infection studies.**—Abs. in *Phytopath.*, xvii, 1, pp. 47–48, 1927.

Fusarium niveum, which has been obtained from the stems, leaves, fruit, and roots of infected watermelon vines, causes cankers on the primary and secondary roots at any point below the surface of the soil, but especially from six inches to two feet down. The development of lesions, which in the early stages are water-logged, light yellow areas from one half to several centimetres long, is followed by vascular invasion.

Supposedly immune citron [*Citrullus vulgaris* var.] plants have yielded *F. niveum* in a form pathogenic to watermelon seedlings. Seemingly healthy watermelon plants, on land that had never before borne watermelons, likewise yielded the fungus, which can apparently remain alive in soil where watermelons have not been grown for at least sixteen years.

SHARP (C. G.). **Correlation of virulence and acid agglutination of a smooth and a rough strain of Bacterium phaseoli sojense.** Abs. in *Phytopath.*, xvii, 1, p. 49, 1927.

When inoculated into leaves of soy-beans by needle pricks, a smooth strain isolated from a culture of *Bacterium phaseoli sojense* produced 62 per cent. infection, and a rough one 39 per cent., in four days, both strains producing 100 per cent. infection in eight to ten days. The lesions produced by the smooth strain averaged 1·033 mm. and those by the rough 0·808 mm. in diameter. The rough strain agglutinated spontaneously in distilled water, the smooth one did not. The former also agglutinated in distilled water plus acid or alkali through the wide range of P_H 1·2 to 9·4 with low agglutination at about P_H 5·5, the latter only through the narrow range P_H 2 to 3. Smoothness, therefore, is apparently correlated with greater virulence and lesser agglutinability. Both strains remained constant in culture.

LINK (G. K. K.) & SHARP (C. G.). **Serological differentiation of Bacterium campestre from Bact. phaseoli, Bact. phaseoli sojense, and Bact. flaccumfaciens.**—Abs. in *Phytopath.*, xvii, 1, pp. 53–54, 1927.

That *Bacterium campestre* [*Pseudomonas campestris*], the crucifer pathogen, and *Bact. phaseoli*, *Bact. flaccumfaciens*, and *Bact. phaseoli sojense*, the three yellow pathogens of beans (which in culture are quite similar morphologically and physiologically), are, though closely related, serologically distinct, is the conclusion reached by the authors from the application of agglutination tests. The results of these tests and the deductions therefrom are briefly discussed.

SHARP (C. G.). **Serological and physiological studies of Bacterium phaseoli, Bact. phaseoli sojense, and Bact. flaccumfaciens.**—Abs. in *Phytopath.*, xvii, 1, p. 54, 1927.

The results of agglutination tests applied to *Bacterium phaseoli*, *Bact. phaseoli sojense*, and *Bact. flaccumfaciens* [see preceding abstract] indicated, according to the writer, that the organisms contain serologically different proteins, since they can be differentiated by these tests. The effect on dextrose, galactose, levulose, lactose, and maltose of these organisms grown in 2 per cent. sugar broths sterilized by filtration and adjusted to P_H 6·8 to 7·2 is described. Formal titration of gelatine cultures will not serve to differentiate between all three organisms, but will differentiate *Bact. flaccumfaciens* from the others.

RAVAZ (L.). **Anthracnose.**—*Prog. Agric. et Vitic.*, lxxxvii, 1, pp. 3–7, 1 col. pl., 1927.

The author discusses, in popular terms, the various diseases of the vine known under the name of anthracnose in France. 'Anthracnose ponctuée' is characterized by the presence of small, black dots on the stems, peduncles, pedicels, and rarely on the fruit. The spots originate beneath stomata in growing regions but persist indefinitely. They appear when the plant is exposed to very moist atmospheric conditions and dry out, die, and blacken when fine weather returns.

'Anthracnose deformée', which is rare on local varieties but more frequent on *Vitis aestivalis*, results from the destruction of the epidermis of the leaves caused usually by dry and cold winds.

The true anthracnose, still often called 'anthracnose maculée' [*Gloeosporium ampelophagum*], is described in some detail. The most susceptible varieties are the Alicante strains and the French and American varieties with thick leaves. The usual treatment with iron sulphate and sulphuric acid solution is recommended for this disease.

RAVAZ (L.). **A propos de l'anthracnose.** [On anthracnose.]—*Prog. Agric. et Vitic.*, lxxxvii, 3, pp. 57–60, 1927.

Continuing his observations on anthracnose of the vine [*Gloeosporium ampelophagum*: see preceding abstract] the writer states that it is not known whether the disease is indigenous to America or whether it has been introduced into that continent from Europe. It has been noticed, however, that American vines, which are almost the only kind of stocks used in France and are also grown as direct producers, sustain very severe damage from this disease. Care must be taken that cuttings of the American varieties do not bear cankers, for these may afford an entrance to various secondary parasites.

Further details are given regarding the control of the disease. Cuttings should be immersed in a 25 to 30 per cent. solution of sulphate of iron. In the open field spraying or painting the vines with the same fungicide causes no injury to the buds. In nurseries, the young shoots should be treated as soon as they appear with a neutral solution of 1 per cent. Bordeaux mixture and again at fairly frequent intervals during wet seasons. Fertilizers such as nitrate

of soda, lime, or potash, if applied about three weeks before grafting, are said to promote a healthy development of the vine.

RHOADS (A. S.). **Diseases of Grapes in Florida.**—*Florida Agric. Exper. Stat. Bull.* 178, 82 pp., 48 figs., 1926. [Received April, 1927.]

The present bulletin was prepared, in view of the rapid development of viticulture in Florida during the past few years, for the purpose of supplying the local vine growers with brief, popular descriptions of the chief diseases to which the crop is subject. Most of the diseases described are well known. They comprise anthracnose (*Sphaceloma ampelinum*) [*Gloeosporium ampelophagum*: *R.A.M.*, iv, p. 477]; black rot (*Guignardia bidwellii*); downy mildew (*Plasmopara viticola*); powdery mildew (*Uncinula necator*); bitter rot (*Melanconium fuligineum*); ripe rot (*Glomerella cingulata*); root rot (*Armillaria mellea* and *Clitocybe tabescens*); crown gall (*Bacterium tumefaciens*); leaf blight (*Isariopsis clavispora*) [*Cercospora viticola*]; and leaf rust caused by *Physopella* [*Phakopsora*] *vitis*. A separate section deals with diseases due to physiological causes, such as non-setting of fruit ('coulure'), shedding of fruit, chlorosis, and also with injuries due to meteorological causes and to animals. The bulletin terminates with a description of some fungicides and insecticides, and of their application.

MOREAU (L.) & VINET (E.). **Remise en état d'une parcelle de Vigne en voie de dépérissement.** [Rejuvenation of a vineyard subject to wilting.]—*Rev. de Vitic.*, lxvi, 1702, pp. 85–88, 2 figs., 1927.

A case of vine wilt was observed in Anjou in 1924 and attributed to the combined action of *Phylloxera* [*vastatrix*] and *Roesleria hypogaea* [*R.A.M.*, iii, p. 567]. In the present paper the authors describe the symptoms of attack and the control measures which have proved successful in rejuvenating the vines on a badly attacked plot, thus obviating the necessity of eradicating diseased individuals.

The external symptoms were evidently associated with *Phylloxera*, but an examination of severely attacked stocks revealed the presence of fructifications of *R. hypogaea* on the roots. The fact that the mycelium was found only in the dead tissues and never in the woody tissues of the living roots indicates the primarily saprophytic nature of the fungus, which evidently only acts in conjunction with the *Phylloxera*, aggravating the intensity of attack.

In regard to control measures, experiments over three successive seasons (1924–6), using applications of carbon bisulphide (83 to 145 kg. per hect.), sodium arsenite (10 kg.), and nitrate of soda (50 to 65 kg.), have shown a progressive decrease in the percentage of infected stock, viz., 27, 9·4, and 1·7 in the three successive years. The remarkable decrease in the proportion of stocks attacked and the rejuvenating effects apparent in this particular vineyard indicate clearly the advantages of this treatment in spite of its high cost (average 1,365 francs per hect. each year), as compared with

the eradication system, which necessitates the establishment of new plantations.

Plant diseases.—*Fifth Ann. Rept. Min. of Agric., Govt. of Northern Ireland, 1925–26*, pp. 29–31, 1927.

Late blight of potatoes (*Phytophthora infestans*) was very prevalent and severe in most parts of Northern Ireland during the period under review, the haulms being practically destroyed by the middle of August.

The most important disease of flax was seedling blight (*Colletotrichum linicolum*) [*C. lini*: *R.A.M.*, ii, pp. 116, 118; iv, p. 219], which was found on 75 per cent. of the samples of seed examined. The presence of the fungus in vigorous plants indicates that the disease may remain latent unless weather conditions at critical periods are unfavourable to the crop. Samples of seed harvested in England have been found to carry infection.

Five years' experiments have shown that American gooseberry mildew [*Sphaerotheca mors-uvae*] and the larvae of the gooseberry sawfly [*Pteronus ribesii*] can be controlled by the application of lime-sulphur 1 in 99, plus 2½ lb. lead arsenate paste and 5 lb. freshly hydrated lime per 100 galls. water. For the control of gooseberry mildew alone, the Whinham's Industry, Crown Bob, and Keepsake varieties should be sprayed, immediately after flowering and three weeks later, with ammonium polysulphide 1 to 199, plus 4 lb. soft soap per 100 galls. spray fluid. The Amber and all other sulphur varieties should be sprayed once in February with a 2 per cent. caustic soda solution, and twice in summer (at the above-mentioned periods) with a solution of 1 oz. washing soda per gall.

Summer applications of excess lime Bordeaux mixture (2¼ lb. copper sulphate, 8 lb. fresh burnt lime, and 40 galls. water) have proved very valuable in the control of apple scab [*Venturia inaequalis*] and other diseases.

Leaf blight of celery [*Septoria apii*] was well controlled at the Greenmount Agricultural College, Co. Antrim, by four or five applications of 2 per cent. Burgundy mixture (8 lb. copper sulphate, 10 lb. washing soda, and 40 galls. water).

During the last few seasons forest tree seedlings, especially Sitka spruce [*Picea sitchensis*] and Douglas fir [*Pseudotsuga taxifolia*] have suffered severely from fungous diseases associated with the presence of species of *Rhizoctonia* and *Botrytis*. Perfect control is obtainable by the disinfection of the seed-beds with 1 gall. dilute sulphuric acid (2 oz. concentrated acid per gall. water) per sq. yd. at sowing time.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1925.** [Report on the activities of the Phytopathological Service in the year 1925.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 44, 124 pp., 7 pl., 8 graphs, 1926. [Received June, 1927.]

The following are some of the many interesting phytopathological records in this report, which has been prepared on similar lines to those of previous years [*R.A.M.*, iv, p. 588]. Foot rot of wheat was

unusually prevalent, especially on crops following wheat, barley, or legumes, and was, in every case examined, associated with *Ophiobolus herpotrichus*, though the possibility of other organisms being involved is not excluded. Three physiological diseases of oats on marshland were reported. The first was characterized by a brown spotting and desiccation of the leaves, the second by broad, pale stripes, and the third by a greyish-brown discoloration of the foliage. Good results in the control of the reclamation disease were obtained by the application of copper sulphate [ibid., vi, p. 350], while manganese sulphate was again effective in the prevention of grey speck [ibid., iv, p. 342]. Flag smut of rye [*Urocystis occulta*], which is of very rare occurrence in Holland, caused heavy damage in one district. Barley was severely attacked by rust (*Puccinia simplex*).

Equally good control of wheat bunt [*Tilletia tritici* and *T. levis*] was given by immersion in the following solutions: 200 gm. copper sulphate in 2·5 l. water per hectol. seed-grain; 100 gm. uspulun, germisan, or tillantin C in 3 l. water; 25 or 50 gm. germisan in 3 l. water; and 1·5 per cent. or 50 gm. sch. 678 (höchst) in 3 l. water. Cusperit and porzol dusts applied at the rate of 4 and 2 gm. per kg., respectively, were also effectual. Stripe disease of barley [*Helminthosporium gramineum*] was controlled only by immersion in germisan at the rate of 100 gm. in 3 l. water per hectol. of seed grain.

A general reduction in the incidence of virus diseases of potatoes has been effected by early lifting. Wilt disease (*Verticillium albo-atrum*) occurred sporadically on the Zeeuwsche Blauwen variety, while *Spongospora subterranea* was observed on Industrie. A disease resembling, but distinct from, stipple streak [ibid., vi, p. 114] occurred on the Vondeling variety wherever this was cultivated.

A black discoloration and decay of fodder beets associated with *Phyllosticta* sp. and *Clasterosporium* [*Sporodesmium*] *putrefaciens* [ibid., iv, p. 61] was found to be primarily due to excessive alkalinity of the soil. The best results in the control of root rot of beets (*Phoma betae*) were given by two hours' immersion of the seed in 0·5 per cent. germisan, agfa, or tillantin C.

Various preparations were tested for their efficacy in the control of *Botrytis* sp. and *Colletotrichum linicolum* [*C. lini*: see last abstract] on flax [ibid., iv, p. 738]. None of the treatments was entirely satisfactory, but some degree of control was given by seed dusting with uspulun, 225 (tutan), and 1762 B (abavit B); the last-named preparation caused a reduction of germination.

Acacia trees at Leersum suffered from a disease believed to be due to a red-spored *Fusarium*, which gained admission to the cortex through the lenticels. *Acer pseudoplatanus* and *A. negundo* were attacked by *V. dahliae* [ibid., v, p. 641].

Hydrangeas imported from France and Germany were affected by a mildew (probably *Erysiphe polygoni*). *Coniothyrium wernsdorffiae* [ibid., iv, p. 655] was observed on roses, this being the first record of the disease for Holland. A black discoloration of *Gloxinia* leaves is attributed to *Phytophthora cactorum* or *P. parasitica*. *Lavatera* plants from Graveland showed at the leaf axils and on the petioles black, sunken lesions due to *Colletotrichum*

malvarum. Both these two last-named records are believed to be new for Holland. *Botrytis parasitica* occurred with unprecedented severity on Murillo tulips following potatoes and peas [ibid., v, p. 33]. It is thought that the fungus probably occurred on the latter host and persisted in the soil in the sclerotial stage. The possible identity of *B. parasitica* with *B. cinerea* is briefly discussed, since it is only the latter species that is known to occur on peas. *Fritillaria meleagris* bulbs imported from France suffered from a dry rot associated with the sclerotia of a *Botrytis*, probably *B. cinerea*.

A fungus closely resembling *Stromatinia* [*Sclerotinia*] *linhartiana* [ibid., iii, p. 370] occurred on the leaves of *Prunus padus*.

A *Phytophthora*, probably *P. cactorum*, was isolated from diseased currant leaves. Black currants were attacked by American gooseberry mildew (*Sphaerotheca mors-uvae*), from which they have hitherto been immune in Holland.

One-year-old apple grafts were destroyed by a species of *Phomopsis*, probably identical with *P. mali* [*Diaporthe perniciosa*: *R.A.M.*, v, p. 343] which was not previously known to occur on this host in Holland.

Didymaria prunicola was isolated from the roots and stems of plum seedlings that were dying apparently from a fungous infection.

Gloeosporium concentricum and bacteria were associated with a highly infectious disease of cauliflowers in the Langendijk district. A yellow discoloration of the leaves was rapidly followed by the decay of the tissues. The primary cause of the disease is, however, regarded as uncertain.

Krankheiten und Beschädigungen der Kulturpflanzen in den Jahren 1922–1924. [Diseases and pests of cultivated plants in the years 1922–1924.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 30, 400 pp., 1 map., 1927.

This report, which has been prepared on the usual lines [*R.A.M.*, vi, p. 145], contains a number of phytopathological records. The sections on fungous and bacterial diseases have mostly been written by Dr. H. Pape. In addition to items already noticed from various sources, the following may be mentioned.

In 1922 the snow fungus of rye (*Fusarium nivale*) [*Calonectria graminicola*] was responsible for severe damage, amounting to 80 and 90 per cent. in Upper Bavaria and Swabia, respectively, while ergot of rye (*Claviceps purpurea*) was extremely prevalent in the Saxon Free State and Bavaria. *Typhula graminum* was found on wheat, barley, and rye in various districts. Root rot of beets (*Pythium de Baryanum*, *Phoma betae*, and *Aphanomyces levis*) caused heavy losses in Saxony. Of the total potato harvest of 40,665,360 tons, 1,487,458 tons (3·7 per cent.) were diseased. *Gloeosporium orbiculare* produced spots on cucumber fruits in the Königsberg district of East Prussia.

In 1923 the foot rots of wheat (*Ophiobolus herpotrichus*) and rye (*Leptosphaeria herpotrichoides*, and *Fusarium* spp.) were responsible for extremely heavy losses (up to 100 per cent. in the light soils of Westphalia) in several provinces. Of the total potato

harvest of 32,579,930 tons, 655,734 tons (2 per cent.) were diseased. Plum pockets (*Taphrina pruni*) was most injurious in Pomerania, causing a loss of 70 per cent. in one locality, and was also prevalent in East Prussia, Grenzmark, and Brandenburg. Apple mildew (*Podosphaera leucotricha*) caused exceptionally heavy damage, sometimes resulting in entire failure of the harvest, particularly in Grenzmark, Brandenburg, and Hesse-Nassau [ibid., iii, p. 339].

Macrophoma hennebergii was common on wheat in Lübeck in 1924 and was also reported from several other localities. *Marssonia* [*Marssonina*] *graminicola* was very severe on barley in Bavaria in the same year.

Of the total potato harvest of 36,402,241 tons, 3,333,607 tons (9·2 per cent.) were diseased in 1924, this being considerably more than the four-year average for 1920–23 (2·9 per cent.). Wart disease [*Synchytrium endobioticum*] spread considerably during the wet summer of 1924 and was recorded in 296 parishes of 17 provinces, as against 147 of 14 provinces in 1922. Blackleg [*Bacillus atrosepticus*] was very prevalent in Hanover, Hesse-Nassau, the Rhine Provinces, and Lübeck. Bacterial wet rot caused heavy losses (50 to 60 per cent.) on damp soils in Hesse-Nassau, the Rhine Provinces, the Saxon Free State, and Hanover. Scab [*Actinomyces scabies*] caused losses of up to 95 per cent. in the Saxon Free State. Leaf roll was responsible for heavy damage in Silesia and the Saxon Free State (up to 75 per cent.).

Onions were reported to be attacked by *Urocystis cepulae* in Saxony in 1922 and 1924 and in East Prussia in 1922. Anthracnose of clover (*Gloeosporium caulivorum*) was prevalent in certain localities in 1924, causing severe infection (25 to 50 per cent.) in the Chemnitz district.

The year 1924 may be termed a *Peronospora* year. Downy mildew of the vine (*Plasmopara viticola*) occurred in Württemberg with greater intensity than at any time since 1906 [ibid., iv, p. 330], and caused severe devastation in Baden. Roter brenner (*Pseudopeziza tracheiphila*) was prevalent in the Rhine Provinces.

VENKATA RAO (M. K.). **Annual Administration Report of the Mycological Section for the year 1925–26.**—*Ann. Rept. Agric. Dept.* [*Mysore*] *for the year 1925–26*, Part II, pp. 7–9, 1927.

The koleroga disease of areca palms [*Phytophthora arecae*] was very severe in July, 1925, but the steady increase in its control by spraying, in years when the distribution of the rainfall is favourable, is regarded as highly satisfactory. The total area treated during 1925 was 6,602 acres compared with 5,503 in 1924 [cf. *R.A.M.*, vi, p. 78]. The operations were conducted by 1,015 garden owners and the value of the crops saved by spraying is estimated at Rs. 1,800,000 [£135,000]. The use of the simple and economical casein-Bordeaux mixture has been much extended of recent years and resin is now largely superseded as a spreader. Nearly two tons of casein were used for spraying work over an area of 4,000 acres. Further trials with the Martini Bordeaux solution [loc. cit.] gave satisfactory results. During 1926 the

seasonal conditions were unfavourable for spraying, with the result that a comparatively small acreage was dealt with.

A disease of areca palms which appears to be new to Mysore is under investigation in the Kalasa district. Affected trees shed their nuts prematurely and the kernel tissues were found to be teeming with bacteria. The disease is quite distinct from koleroga and somewhat more severe.

Further progress has been made in the control of coffee koleroga [*Corticium koleroga*] by spraying with Bordeaux mixture. The 1 per cent. mixture seems to be quite as efficacious as the 2 per cent.

The so-called 'black bean' disease of coffee [ibid., iv, p. 591] is under investigation.

Mycological notes.—*Ann. Rept. Seychelles Dept. of Agric. for the year 1926*, p. 4, 1927.

Among the fungi recorded in the Seychelles during 1926 were *Septoria cocoes* and *Phyllosticta* sp. on discoloured patches of the heart leaves of Palmyra palm [*Borassus flabellifer*]; *Ganoderma lucidum* on cashew stems (*Anacardia occidentalis*); and a *Septobasidium* covering *Ichnaspis* scale insects on coco-nut leaves.

BENSAUDE (MATHILDE). **Inventário das moléstias das plantas agricolas de S. Miguel.** [Inventory of the diseases of economic plants in St. Michael.]—*Bol. Agric. e Econ. da Soc. Corretora Ltda.* (*Azores*), ii, 11, p. 1; 12, pp. 1–3; iii, 1, pp. 1–3; 2, pp. 1–2, 1926; 3, p. 1; 4, pp. 3–4, 1927.

In this list, arranged by hosts, of the most prevalent diseases and pests of economic plants in the island of St. Michael (Azores), the following may be mentioned in addition to those already noticed [*R.A.M.*, vi, p. 80].

Glomerella cingulata is of frequent occurrence on nearly ripe fruits of *Anona*, and fig rust (*Kuehneola fici*) is also prevalent.

Gloeosporium musarum causes severe damage to bananas in store or during transport. Bananas are also seriously affected by a disease attributed to a species of *Stachylidium* [ibid., vi, p. 145], which causes a blackening and withering of the perianth and tip of the fruit, and the same fungus has been observed in blackened tips on bunches of bananas collected in the Canary Isles and Madeira. It is recommended to remove the pistil and perianth as soon as the fruit begins to form. An undetermined fungus, with a white mycelium, later becoming brown, was associated with a rot of the rhizome of bananas planted between orange trees. The fungus appears to persist in the soil, thus infecting newly planted suckers.

Colletotrichum tabificum [*C. atramentarium*: ibid., v, p. 124] was observed for the first time in the island in June, 1925, on potato plants raised from Scotch seed. The symptoms corresponded exactly with those described elsewhere in connexion with the black dot disease of potatoes. Of the virus diseases, mosaic was extremely marked on seed potatoes from Scotland and Lincolnshire.

Since the introduction of sweet potato black rot (*Sphaeronema*

fimbriatum) [*Ceratostomella fimbriata*], probably on sweet potatoes coming from Demerara in 1897, this disease has proved very destructive in the island. Disinfection of the tubers with copper sulphate appears to be the only effective preventive, and it is recommended to avoid replanting on infected areas for at least three to four years. The skin spot caused by *Monilochaetes infuscans* is of frequent occurrence, and also the storage rot due to *Rhizopus nigricans*.

Cercospora beticola appears to be very prevalent, affecting the root development of young beet plants and the sugar content of older plants.

The most destructive disease of onions is white rot (*Sclerotium cepivorum*). Pink root (*Fusarium malli*) also caused damage both to very early sown onions and to late varieties. *Bacillus cepivorus* causes rotting and a disagreeable odour in onions in storage; this disease and also the black mould (*Sterigmatocystis nigra*) [*Aspergillus niger*] are of decided economic importance.

A mildew of carrots due to a species of *Erysiphe* (probably *E. polygoni*) was observed. Gourds [*Cucurbita*] were attacked by *Colletotrichum lagenarium*. *Uromyces fabae* occurs on *Vicia faba* and *U. appendiculatus* var. *phaseoli* on *Phaseolus vulgaris*. A variety of the latter known as 'feijão de guisar' appears to be immune from the rust.

A leaf spot of *Colocasia* is attributed to a species of *Cladosporium*, probably *C. colocasiae* described by Sawada in Formosa. *Ramularia cynarae* occurred on cardoons [*Cynara cardunculus*] raised from French seed.

Root disease (*Rosellinia necatrix*) was found to cause severe injury to tea in certain regions. *Pestalozzia guepini* attacked the leaves of camellias.

Chrysanthemum rust (*Puccinia chrysanthemi*) was frequent on the under surface of the leaves in the autumn; *Septoria chrysanthemella* was also found. *Exobasidium azaleae* was recorded on azaleas, but did not cause much damage.

A bacterial rot of the corms of arum lilies, caused by *Bacillus carotovorus*, was observed in a garden at Ponta Delgada; the corms were planted in October and the disease was evident in December and January. The occurrence of this disease in the island is at present infrequent.

Amongst the diseases of citrus trees, gummosis is one of the most destructive, the symptoms varying with the different species. For example, in the case of the tangerine, a swelling of the bark is seen at the base of the tree and very little gum is exuded but the tree dies rapidly. On bitter oranges the gummy exudation is evident at the base of the trunk and main branches, but the disease progresses slowly, often healing over. On lemon trees, which are especially susceptible to attack, gum drops are formed beneath the bark, which is less swollen immediately above the diseased tissues. Root rot (*Rosellinia necatrix*) causes severe damage to citrus trees over twenty-five years old. In March, 1925, stem-end rot (*Phomopsis citri*) was found on grapefruit, but is at present confined to a limited area.

Methods of control are recommended in all cases.

Plant Pathology and physiology.—*Thirty-ninth Ann. Rept. Texas Agric. Exper. Stat.*, pp. 45–85, 1926. [Received April, 1927.]

The cause of cotton root rot [*Phymatotrichum omnivorum*: *R.A.M.*, vi, p. 227] apparently spreads underground by means of root contact. Experiments on clean fallowing showed that the percentage of infection may be considerably reduced by eradicating the weed carriers, the chief of which in Central Texas is *Ipomoea trichocarpa*. Considerable difficulty was experienced in germinating the spores of the fungus, which were obtained in pure cultures: treating them with a weak soap solution gave a small percentage of germination, but in every case the result was a very short germ-tube which failed to develop further. The ability of this fungus totally to destroy its host was found to depend on the time of year in which infection took place. Young seedlings infected early in July wilted and revived alternately for a period of from four to ten weeks before finally dying. Infection of the host and also the spread of the disease from one plant to another were found to be less rapid than hitherto believed, being apparently influenced by the age of the plant and possibly by conditions of concentration of the sap, and also by the season. The adjoining plants to those infected early in July took from one to 126 days to become infected, but as the season advanced and the plants aged, the time necessary for the spread of the fungus varied only from one to five days.

Experiments to determine the tolerance of the fungus to an alkaline or acid medium by growing pure cultures in media to which sodium hydroxide or hydrochloric acid were added indicated that the extreme range for growth was from P_H 8·84 to 4·05, the optimum being from P_H 6 to 8. It might be possible to control root rot in some soils by changing their reaction either to a greater degree of acidity than P_H 4 or of alkalinity than 9. The P_H value of samples of soil collected from various parts of the State where the prevalence of root rot varied supported these laboratory studies.

Root rot occurred to a limited amount on practically every soil type in Wichita County. While sandy soils were perhaps less affected than the heavier soils, large spots of root rot were found on soils of the coarsest texture. On heavy clay loams, lucerne also showed a high degree of susceptibility, while many other crops and also various shade trees were more or less severely attacked. Guar [*Cyamopsis psoraloides*] proved highly resistant.

Work on the possible effect of sulphur in controlling powdery and downy mildew of cantaloupes [*Erysiphe cichoracearum* and *Pseudoperonospora cubensis*] showed that sulphur in any form could not be used on cucurbit leaves without serious burning injury.

ROBBINS (W. J.). **Botany.**—[*ex* Solving farm problems by research: one year's work, Agricultural Experiment Station (Report of the Director; July 1, 1925 to June 30, 1926).] *Missouri Agric. Exper. Stat. Bull.* 244, pp. 30–32, 1926. [Received June, 1927.]

This report contains the following references of phytopathological

interest in addition to those noticed in this *Review* from other sources. Investigations were conducted on the effect of the hydrogen-ion concentration on the toxicity of acid and basic dyes to three fungi, *Gibberella saubinetii*, *Fusarium oxysporum*, and *Rhizopus nigricans*. The toxicity of acid dyes in liquid or solid media was found to be much increased for *R. nigricans* in solutions acid to about P_H 5·0 and for *G. saubinetii* to P_H 6·4. The basic dyes are decidedly more toxic in solutions alkaline to these points. *F. oxysporum* responds similarly to *G. saubinetii*. These data are correlated with the isoelectric points for *G. saubinetii* and *R. nigricans* but not with that for *F. oxysporum* [*R.A.M.*, iv, p. 720].

A study of the relative resistance of 29 strains and varieties of wheat to scab (*G. saubinetii*) was continued [ibid., v, p. 474]. Artificial inoculation with spore suspensions of three different strains of the causal organism failed to give more than 10 per cent. infection on the most susceptible varieties. The Red May strains continue to show marked resistance, the W 203, W 210, and W 214 selections showing only 0·28, 0·37, and 0·18 per cent. infection, respectively. Poole C. I. 5653 (W 174) also showed 0·18 per cent. infection, and in three years' trials has given an average of only 0·47 per cent. The Turkey-Kanred strains and most of the Mediterranean group continued to show relatively high infection.

Fusarium blight of lucerne [loc. cit.] continues to cause heavy damage, and a serious bacterial disease [? *Aplanobacter insidiosum*: ibid., vi, p. 400] has also affected this crop, involving losses up to 70 per cent. in some cases. The symptoms consist of a dry rot confined to a zone about one inch long at the crown, and a yellow discoloration and rapid collapse of the plants. Small brownish areas in the interior of the rotted zone were found to contain masses of bacteria.

The *Cytospora* canker of apples (probably due to the *Cytospora* stage of *Valsa leucostoma*) [ibid., iv, p. 614] is stated to be widespread in Missouri orchards, especially among trees already weakened by the attacks of fungous root rots or other causes.

MARTIN (W. H.). **Report of the Department of Plant Pathology.** —*Forty-sixth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1925*, pp. 443–457, 1 graph, 1926. [Received May, 1927.]

This report contains details of the distribution, intensity of, and losses caused by a number of fungous diseases of plants in New Jersey.

Apples were more severely attacked than usual by blotch (*Phyllosticta solitaria*), black rot (*Physalospora cydoniae*), and scab (*Venturia inaequalis*), the estimated loss for the State from the last-named being 12 per cent.

Leaf spot of pears (*Fabraea maculata*) was general in the central and southern districts, causing a loss of 20 per cent. for the State.

Peaches in the East Vineland sections showed up to 40 per cent. infection with yellows and little peach.

Anthracnose of currants (*Pseudopeziza ribis*) caused extensive

defoliation and reduced the crop by 10 per cent. Gooseberries were similarly affected.

Root rot of strawberries, associated with winter injury and the attacks of *Rhizoctonia*, is becoming increasingly severe.

Apparently identical strains of *Verticillium albo-atrum* were isolated from diseased eggplants [*Solanum melongena*], okra [*Hibiscus esculentus*], chrysanthemum [*R.A.M.*, v, p. 347], rose, and peach. On okra the disease is so severe that the cultivation of this crop has been largely discontinued in Burlington County.

Mosaic of potatoes was more serious than usual, the loss for the State being estimated at 3 per cent. A masking of the symptoms at midsummer was very common. In a comparison of certified and uncertified seed the former showed 3 and the latter 50 per cent. leaf roll. Spraying with Bordeaux mixture gave excellent control of early blight of potatoes (*Alternaria solani*), with an increase of 49·4 bushels per acre in one test.

The estimated loss from leaf spot (*Septoria lycopersici*) of tomatoes was 10 per cent. Mosaic was very prevalent in the Stone, Bonny Best, Greater Baltimore, and Acme varieties.

Late blight of celery (*Septoria petroselini* var. *apii*) [*S. apii*] was widespread, causing up to 100 per cent. infection with a loss of 10 per cent. for the State.

Root rot of peas (*Aphanomyces euteiches*) caused losses of 15 per cent. in the southern counties. In spite of heavy infection the World's Record and Sutton's New Ideal gave good yields where Alaska was killed before maturity. Mosaic is apparently becoming of economic importance on the dwarfed, stocky varieties of peas, e. g., Little Marvel.

Hard rot of Gladiolus (*Septoria gladioli*) [ibid., v, p. 430] was unusually prevalent, the Eshwaben variety being particularly affected.

CHARDON (C. E.) & TORO (R. A.). **Plant disease notes from the Central Andes.**—*Phytopath.*, xvii, 3, pp. 147–153, 1 map, 1927.

The present paper gives brief notes on the principal plant diseases observed by the senior author in the Central Andes during his visit in 1926 to the State of Antioquia in Columbia. The diseases of coffee referred to have been already noticed from another source [*R.A.M.*, vi, p. 352]. Sugar-cane diseases include 'gomosis' [gumming disease, *Bacterium vascularum*] which is stated to have been encountered in many fields, the Castilla cane, which forms the main bulk of the crop in the region, being highly susceptible to it. The disease appears to have been established in the Central Andes for many years, probably prior to its appearance in Porto Rico, and is believed to have been introduced from Brazil, where it was recorded as a serious trouble in 1869. The prevalence in Antioquia of the rind disease (*Melanconium sacchari*) of sugar-cane is explained by the deteriorated condition of the cane varieties cultivated and by the very poor soil. Ring spot (*Leptosphaeria sacchari*) causes considerable discoloration of the leaves, but does not appear to occasion any great damage to the canes. Despite diligent search no mosaic was found on sugar-cane, maize, or other

grasses; the mosaic disease is, however, quite prevalent on tobacco, and a high percentage of infection is often found in the fields. Rust (*Uromyces appendiculatus*) is common on the bean [*Phaseolus vulgaris*] and lima beans [*P. lunatus*]. Other diseases listed include rust of the fig (*Kuehneola fici*), scab (*Sphaceloma fawcettii*) on the sour orange (*Citrus aurantium*), *Pestalozzia palmarum* on the leaves of the coco-nut, *Septoria lycopersici* on the leaves of tomato, and *Phyllachora gratissima*, which causes a tan-coloured spot on the leaves of the avocado pear.

Report of the Guam Agricultural Experiment Station, 1925.—20 pp., 13 figs., 1926.

The only references of phytopathological interest in this report are the statement that amongst the diseases of muskmelons, cucumbers, and squashes observed, none did more damage than the powdery and downy mildews [*Erysiphe cichoracearum* and *Pseudoperonospora cubensis*], which were effectively controlled by Bordeaux mixture, and that a few cases of coco-nut palm bud rot were discovered during the year. It is hoped that the last mentioned disease has been eradicated by the prompt destruction of the infected palms.

Melander (L. W.) & Craigie (J. H.). **Nature of resistance of Berberis spp. to Puccinia graminis.**—*Phytopath.*, xvii, 2, pp. 95–114, 1 fig., 3 graphs, 1927.

It is known that the germ-tubes from sporidia of *Puccinia graminis* penetrate the cuticle of leaves of *Berberis* spp. directly, and Waterhouse has shown [*R.A.M.*, i, p. 241] that this is accomplished by mechanical pressure alone. An investigation has, therefore, been undertaken to ascertain if a correlation exists between susceptibility or resistance to infection of barberries and the thickness and resistance to mechanical puncture of the external epidermal walls. The observations were made on 6 susceptible, 4 resistant, and 2 immune species of *Berberis* and 1 susceptible, 1 resistant, and 1 immune species of *Odostemon* [*Mahonia*]. Measurements of the thickness of the external epidermal walls were made with leaves 2 to 3 days, 5 to 6 days, and 16 to 20 days old, and the mechanical puncture tests, the results of which are tabulated in detail and presented in graphs, were performed on leaves from 1 to 14 days old by means of a modified Jolly balance, furnished with a specially ground, round-pointed gramophone needle. The results indicated that varieties of barberries with thin and easily punctured external epidermal walls are those most susceptible to rust and that those very resistant to puncture are usually most resistant to infection. The leaves of susceptible and resistant varieties become immune with increasing age on account of the thickening of the walls and rapid increase in resistance to puncture. The resistance to infection in two species (*B. brachypoda* and *B. pruinosa*) cannot be explained on the basis of resistance to puncture but appears to be of a physiological nature. While high resistance to puncture, therefore, indicates real resistance to infection and might be used as a criterion for the latter, ease of puncture does not necessarily indicate susceptibility.

DURRELL (L. W.) & LUNGREN (E. A.). **Barberry eradication and sources of black stem rust in Colorado.**—*Colorado Agric. Exper. Stat. Bull.* 315, 18 pp., 6 figs., 1 diag., 3 maps, 1927.

The average annual loss from black stem rust of wheat (*Puccinia graminis tritici*) in Colorado during the period 1916 to 1926 is estimated at $300,000. The most important source of infection is the common barberry (*Berberis vulgaris*) [*R.A.M.*, v, p. 472], but a native species, *B. fendleri*, has recently been proved by inoculation experiments to be also susceptible.

Since the initiation of the barberry eradication campaign in Colorado in 1918–19, 35,006 barberry bushes have been destroyed over a wheat-growing area of 1,150,000 acres. During five years' observations in Colorado it has been observed that barberries may show infection as early as 8th May and wheat by 1st June. In many cases initial infection has been traced six to ten miles from individual bushes. Along the eastern border of the State the earliest appearance of rust during the past four years, in the absence of barberries, has been on 22rd to 25th June, on which date infection could be found only five to ten miles west of the State line. In the irrigated sections of Colorado, some 250 miles west of the eastern border, infection occurs 12 to 17 days later than the first attack in the eastern part of the State, in the absence of local infection from barberries. This indicates a definite migration from east to west. The eradication of the barberry in eastern Colorado has definitely retarded the development of rust by two to three weeks, a period which normally allows the grain to mature before serious damage can be done.

The methods of survey practised in Colorado are briefly described, and directions are given for barberry eradication by the usual means [*R.A.M.*, vi, p. 283].

AAMODT (O. S.). **Breeding Wheat for resistance to physiologic forms of stem rust.**—*Journ. Amer. Soc. Agron.*, xix, 3, pp. 206–218, 1927.

In connexion with a review of contemporary work on breeding wheat for resistance to stem rust (*Puccinia graminis*) [*R.A.M.*, iv, p. 727; vi, p. 405; *et passim*], the writer discusses some of the outstanding problems of a crop improvement programme based on disease resistance. Among the factors to be considered in the development of such a scheme are (*a*) the possible existence of physiologic forms of the pathogenic organism; (*b*) the need of a survey to determine the prevalence and distribution of the various forms; (*c*) the varietal reactions of the host to particular forms; (*d*) the reactions between host and parasite as definite genetic characters; and (*e*) the possibility of combining the resistance to all forms within a single desirable commercial variety.

Studies of species crosses have shown that resistance to stem rust can be transferred from the durums and emmers to common wheats. Greenhouse tests are necessary to determine the mode of inheritance of the reaction of a variety or a hybrid to particular physiologic forms, while the varietal reaction to rust under particular environmental conditions must be judged by a field trial. At present it is impossible to differentiate the plants in respect of their reaction to

particular physiologic forms of stem rust in a general field epidemic. Varieties of wheat resistant to all physiologic forms in the greenhouse, e. g., Khapli emmer and Webster, will also be resistant in the field. Kota, moderately susceptible to most forms in the greenhouse, is fairly resistant in the field. Marquillo is resistant to some forms in the greenhouse and susceptible to others, while in the field it is quite resistant to all these forms. A selection of the durum Velvet Don, which has been highly resistant in the rust nursery for 18 years, was inoculated in the winter of 1925 with 11 physiologic forms of stem rust. It was highly susceptible to all these forms in the greenhouse, but extremely resistant to a rust epidemic produced in the following summer by spraying with most of these forms. A common wheat selection from a cross between Vernal emmer and Marquis was highly resistant in the greenhouse to 10 of the 11 forms but showed susceptibility to form 21. Isolated field plots of this variety sprayed heavily several times during the summer with a uredospore suspension of form 21 were highly resistant. These and other instances show that the reaction of wheat seedlings in the greenhouse cannot always be taken as a criterion of the field reaction.

ZWOBODA (A.). **Zur Gelbrostfrage. I.** [On the question of yellow rust. I.]—*Deutsche Landw. Presse*, liv, 11, p. 149, 1927.

Referring to Hege's paper on the physiological predisposition to yellow rust of wheat (*Puccinia glumarum*) [*R.A.M.*, vi, p. 346], the writer gives some details concerning the development of this disease in Moravia, Czecho-Slovakia. The time of earing is a very critical factor in the reaction of the different varieties to infection. It has repeatedly been observed that early ripening varieties are heavily attacked, while late maturing ones in adjacent plots remain completely healthy. This confirms Tschermak's observation [ibid., iii, p. 209] that precocity of development is the decisive factor in yellow rust infection, inherent varietal susceptibility being of secondary importance.

TISDALE (W. H.), LEIGHTY (C. E.), & BOERNER (E. G.). **A study of the distribution of Tilletia tritici and T. laevis in 1926.**—*Phytopath.*, xvii, 3, pp. 167–174, 1 map, 1927.

An investigation carried out in 1926 to ascertain the distribution in the United States of *Tilletia tritici* and *T. levis* indicated that the former is not responsible for generalized epidemics of stinking smut to the east of the Rocky Mountains, where it is only found locally in the upper Mississippi and Missouri valleys, and in these regions is confined almost entirely to durum wheats. *T. levis* was found throughout the area from Maryland and Delaware on the Atlantic coast to Utah and Montana in the west.

RAPIN (J.). **Action de la température et du sol sur le développement du Tilletia tritici (carie du Blé).** [The effect of temperature and soil on the development of *Tilletia tritici* (Wheat bunt).]—*Ann. Agric. de la Suisse*, xxviii, pp. 79–84, 1927.

Experiments conducted at the Lausanne Experimental Seed

Station on the comparative infection of Mont-Calme XIV wheat seed by *Tilletia tritici* under three different soil temperature ranges, in the experimental field, in steam-heated beds, and in the greenhouse, respectively, gave the following results: in the field soil, the temperature of which varied from 2·4° C. at 8 a.m. in the middle of November to 8° at 2 p.m. early in January, 33 per cent. of the seedlings perished, 43 per cent. were infected, and 24 per cent. were healthy. In the hot-bed, the temperature of which was fairly constant at about 15° (the optimum germination temperature of the spores of *T. tritici* is stated to be 16° to 18°), the corresponding figures were 24, 50, and 26; while in the greenhouse, at a temperature of about 27°, they were 17, 1·3, and 81·7. The differences in the first two cases are not significant, but in the greenhouse the temperature was evidently too high to permit the development of the fungus. The bearing of these results on experimental methods is pointed out.

The comparative incidence of infection in sandy and humus-rich soil was studied by sowing in infected soil, clean seed, seed artificially contaminated with *T. tritici*, clean seed treated with a fungicide, and contaminated seed similarly treated. The seedlings from artificially contaminated seed were more severely attacked than those grown from clean seed. When subsequently treated with copper sulphate or porzol 55, however, the contaminated developed less bunt than the clean seed. Bunt was decidedly less prevalent in the sandy than in humus-rich soils.

The effects of various fungicides on seed artificially infected with *T. tritici* are noted in tabular form. Copper sulphate diminished the germinative power of the seed, and should be neutralized with lime or soda. Mercuric chloride gave excellent results, but its practical utility is unfortunately prejudiced by its great toxicity. Formalin was not always reliable. Copper carbonate dust gave good results.

CHRISTENSEN (J. J.). **Physiologic specialization and parasitism of Helminthosporium sativum.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 37, 101 pp., 12 pl., 1 fig., 1926. [Received June, 1927.]

The present bulletin reproduces and expands most of the information contained in the author's former papers [some in collaboration with other workers] on the physiology and parasitism of *Helminthosporium sativum*, especially on wheat and barley [*R.A.M.*, iii, pp. 27, 643; iv, p. 407; v, p. 287]. Of interest is the fact that the author found evidence of the existence, besides the 37 biological forms studied in detail by him, of numerous other forms, many of which may occur in the same region, while the same form may sometimes occur in widely separated regions. In culture the forms can be distinguished by their rate of growth, proportion of submerged to aerial mycelium, zonation, production of conidia, density of conidial clusters, colour of the mycelium, and their response to temperature. Zonation is apparently influenced by the amount and the kind of medium, and by alternating temperatures; light did not appear to be essential, but zonation may be induced by

diurnal changes in this factor. Neither was light found necessary for the formation of conidia, which are produced abundantly on plant tissues and artificial media by many physiological forms, while others seldom fructify. The production of conidia by Form 1 was greatly affected by temperature, the optimum being between 16° and 25° C., the maximum at about 29°, and the minimum about 10°. The spores of this form can withstand exposure to both low and high temperatures for considerable periods of time if the relative humidity is low and to long periods of alternate freezing and thawing, but high temperatures and high relative humidity are injurious. While, in general, the conidia of *H. sativum* remain viable for a long time under proper conditions (those of several forms retained their germinability for three years, and a successful transfer was made from an old culture after it had been dormant and dry for almost five years), their longevity depends to a certain degree on the physiological form concerned, but still more on the environmental conditions, aeration being an important factor. The germination of the spores and the growth of the germ-tubes were stimulated to a remarkable extent by the addition to distilled water of small fragments of leaf tissue even from plants other than susceptible hosts.

The study of mutations confirmed the results formerly reported [ibid., v, p. 287], the only new feature being that reversions apparently occurred, and when they did, they were always in the form of sectors. Continued growth on artificial media did not apparently attenuate the virulence of the forms, as that of Form 1 was not reduced after growing for six years in pure culture.

Several years of observations showed that the development of the *Helminthosporium* disease on cereals depends on the physiological form present, the amount of inoculum provided, varietal susceptibility of the host, and environmental factors which influence the development of the fungus and the predisposition of the host. Heavy dews and rains, together with high temperatures, are conducive to foliage and ear infection. Peat soils, particularly with deep drainage, are believed to predispose plants to the disease.

Disinfection experiments on wheat and barley seed with a number of dust and liquid fungicides [a list of which is given] showed that none was entirely effective. The treatment did not affect the rate of growth of the seedlings, neither did it control root rot or basal stem rot due to infection by the fungus, nor increase the yields when the seed was sown in infected soil. All varieties of wheat were susceptible, the durums, in general, being the most susceptible, but there were considerable differences in the degree of attack.

There was a high correlation between the data on the relative susceptibility of wheat varieties to *H. sativum* obtained when they were grown at different places in the same year and at the same places in different years. This is believed to indicate that the resistance of wheat is due to genetic factors. It was found, however, that these factors can be influenced considerably by the environment, and by the specialization of the fungus. Very unfavourable growing conditions may predispose even the most resistant varieties of wheat and barley to attack, so that they may be severely injured by virulent forms.

GASSNER (G.). **Verbesserungsmöglichkeiten der Benetzungsbeize.** [Possibilities of improvement in the sprinkling method of disinfection.]—*Deutsche Landw. Presse*, liv, 12, pp. 159–160, 1927.

In this paper the writer recapitulates his arguments in favour of a reduction in the amounts of liquid disinfectants used in the control of fungous diseases of cereals [*R.A.M.*, vi, p. 278]. In recent experiments at Brunswick, 0·5 to 3 per cent. germisan, tillantin [uspulun-universal], and agfa, applied at the rate of 1·5 l. per cwt. of seed-grain, gave excellent control of wheat bunt [*Tilletia tritici* and *T. levis*], snow mould of rye [*Calonectria graminicola*], and stripe disease of barley [*Helminthosporium gramineum*]. The incidence of bunt in the untreated plots amounted to 79 per cent. It is stated that successful control of bunt and snow mould is obtainable even when the fungicides are applied at the rate of only 0·5 l. per cwt. Further experiments along these lines are regarded as highly necessary.

ESMARCH (F.). **Sollen wir trocken beizen oder nicht?** [Shall we dust or not?]—*Die Kranke Pflanze*, iv, 2, pp. 22–29; 3, pp. 37–41, 1927.

After some general observations on the origin and development of liquid treatment and dusting for the control of seed-borne plant diseases in Germany and elsewhere, the author cites data obtained in recent disinfection experiments. In a test conducted at the Dresden Plant Protection Station in 1926, the best control of snow mould of rye [*Calonectria graminicola*] was given by the dusts 998, porzol H [*R.A.M.*, vi, p. 86], and trockenbeize heyden, while tutan and höchst were also satisfactory. Notes on the results obtained in the treatment of wheat bunt [*Tilletia tritici* and *T. levis*] and of stripe disease of barley [*Helminthosporium gramineum*] are also given. In the author's tests, uspulun and agfa, unlike germisan, showed a more reliable action at a temperature of 6° to 8° than at 16° to 18° C. [ibid., v, p. 540].

Among the apparatus known to the author, the Primus, Ideal, and Lothrä [ibid., vi, p. 89] can be recommended. Some figures are given relating to the cost of dusting, which may be estimated at two to four times that of steeping. The price of treating 1 zentner [approximately 1 cwt.] of wheat seed-grain with 0·25 per cent. germisan is Mk. 0·52; with tutan, Mk. 1·23; 0·25 per cent. tillantin, Mk. 0·33; höchst, Mk. 1; kalimat, Mk. 0·38; and abavit B, Mk. 0·77. The high cost of dusting is stated to be amply counterbalanced by the saving of time and labour effected, while the risk to the health of the operators will, in all probability, soon be eliminated.

LEUKEL (R. W.), DICKSON (J. G.), & JOHNSON (A. G.). **Experiments with dusts for controlling stripe disease of Barley.**—*Phytopath.*, xvii, 3, pp. 175–179, 1927.

The results of experiments made in the spring of 1926 to test the efficacy of 21 [listed] disinfectant dusts in the control of the stripe disease [*Helminthosporium gramineum*] of barley showed that wa-wa dust (Chicago Process Company, Chicago, Ill.) almost

entirely eliminated the disease. Abavit B and Du Pont No. 12 were also very effective. S.F.A. No. 225 V, (Saccharin-Fabrik A. G. vorm. Fahlberg, List & Co., Magdeburg-Südost), semesan, Du Pont No. 13–U, No. 13–U.A., No. 45, and Mercury 'C' (Roessler Hasslacher Co., Perth Amboy, New Jersey) reduced the amount of infection in both series of experiments from 16·33 and 15·31, respectively, to less than 1 per cent. There were also indications that the treatments improved the stands.

STRAIB. **Ertragsausfälle durch Streifenkrankheit bei Sommergerste.** [Loss of yield from stripe disease in summer Barley.] —*Deutsche Landw. Presse*, liv, 13, p. 176, 1927.

In continuation of an earlier report on the control of stripe disease of barley (*Helminthosporium gramineum*) [*R.A.M.*, vi, p. 26], the writer gives particulars of the effect of the various disinfectants on the yield. The average increase in the yield from treatment of the seed-grain with germisan, uspulun-universal, tillantin dust, or tutan was 10 to 12 per cent. compared with the untreated controls. The yield of straw was not appreciably augmented. One hour's immersion in water considerably reduced the yield. Germination was markedly stimulated by treatment with the above-named disinfectants.

LINDFORS (T.). **Om betning av Korn- och Havreutsäde.** [On the disinfection of Barley and Oats seed-grain.]—*Centralanst. för Jordbruksförsök Flygbl.* 120, 8 pp., 3 figs., 1927.

Directions are given in popular language for the control of the more important fungous diseases of barley and oats in Sweden by seed treatment. *Fusarium* disease, stripe disease, and covered smut of barley [*Calonectria graminicola*, *Helminthosporium gramineum*, and *Ustilago hordei*, respectively], may be controlled by 20 to 30 minutes' immersion in 0·25 per cent. germisan; one hour in 0·25 per cent. uspulun-universal; and 0·25 to 0·5 per cent. uspulun (for mild cases of stripe disease only). The dusts abavit B (500 gm. per 100 kg.) and tutan (300 gm. per 100 kg.) have given satisfactory control of stripe disease and *C. graminicola*. Uspulun dust (300 gm. per 100 kg.) was inferior to the foregoing in the control of stripe disease but effective against *C. graminicola*.

Loose and covered smut of oats [*U. avenae* and *U. levis*] and *C. graminicola* may be controlled by 15 to 20 minutes' immersion in sublimatformalin, consisting of 100 gm. mercuric chloride in 100 l. of water, to which is added 0·25 l. of 40 per cent. or 0·3 l. of 36 per cent. formalin; by 30 minutes' immersion in 0·25 per cent. germisan; or by steeping in 0·25 per cent. uspulun-universal [time not specified].

Abavit B (500 gm. per 100 kg.) has given good control of the above-mentioned diseases of oats but tends to retard the development of the plants. Tutan (400 gm. per 100 kg.), which is effective only in mild cases of loose smut, is also open to the same criticism.

Loose smut of barley [*U. nuda*] can only be controlled by the hot water treatment, consisting of three hours' presoaking in cold water,

five minutes' immersion (ten hours later) at 50° to 51° C., and a final dip in cold water.

Some general instructions for steeping operations are given.

MARTIN (W. H.). **Oats smut control studies.**—*Forty-sixth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1925*, pp. 457–460, 1926. [Received May, 1927.]

In this series of tests in the control of oat smut [*Ustilago avenae*] with twelve different [named] preparations, the best results were given by the formaldehyde dip (1 in 320), which completely eliminated infection. This method, however, caused a considerable reduction in the percentage of germination. Similar effects were also produced by uspulun (0·25 per cent.) and semesan (0·3 per cent.) on seed-grain germinated in blotters, but not in sand.

BAILEY (D. L.). **Physiologic specialization in Puccinia graminis avenae Erikss. and Henn.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 35, 33 pp., 7 pl., 1925. [Received June, 1927.]

The present investigation of physiological specialization in stem rust (*Puccinia graminis avenae*) of oats (the economic importance of which in the United States is stated to be apparently increasing) is a continuation of the work started in 1923 by Stakman and Levine in collaboration with the present author [*R.A.M.*, iii, p. 22]. It resulted in the establishment of five biologic forms of the rust, which were shown to react differently on six varieties of oats; some of the latter appeared to be identical in resistance and really to represent three groups of differential hosts, composed as follows: (1) Joanette (C. I. 1880) and Strain 703; (2) Richland (C. I. 787), Heigira Rustproof (C. I. 1001), and Monarch Selection (C. I. 1879); (3) White Tartar (C. I. 551). A key is given for the identification of the forms by their reaction on these hosts.

Although significant differences were found in the size of the uredospores in some of the physiologic forms when they were grown under identical conditions, the differences were less than the fluctuations induced in a single form by varying environmental conditions, thus rendering unreliable the identification of the different forms by their morphological characters alone. Forms III and IV, more particularly the latter, were very definitely characterized by the fact that they consistently formed teleutospores from 10 to 15 days earlier than forms I and II. There was also some evidence of a correlation between the virulence of the form and the time required for the production of teleutospores.

The study of the geographical distribution of the forms showed that the forms I, II, and V are very widespread throughout the United States and Canada. Form IV is of Swedish origin, and form III was found in two cultures, one from Sweden and one from South Africa, but neither of these two forms was found in North America. A preliminary study of the grass host range of the five forms showed that they are all remarkably similar in their infective capacities on grasses, and indicated that the host range is rather limited.

An investigation of the relationship between host and pathogen showed that in the Victory variety of oats (which is susceptible to

all five forms) infection proceeds in a manner similar to that of wheat varieties susceptible to *P. graminis tritici*. In the resistant Richland variety the mode of infection is much on the same lines, except that pronounced local killing of the infected tissue seems to limit the development of the fungus. The resistance of this variety did not appear to be dependent on morphological characters.

From a practical point of view, the results of his investigations confirm the author in his belief that the resistance of varieties like White Tartar and Richland will be found sufficient to solve the oat stem rust problem in the United States by breeding and selection, as they are able to withstand the attacks of all the native physiologic forms.

KENDRICK (J. B). **Holcus bacterial spot of Zea mays and Holcus species.**—*Iowa Agric. Exper. Stat. Res. Bull.* 100, pp. 303–334, 5 figs., 1926. [Received May, 1927.]

A bacterial leaf spot disease of maize has been under observation in Iowa since 1916. Subsequently a similar disease was found in sorghum, Sudan grass (*Holcus* [*Andropogon*] *sorghum* var. *sudanensis*), broomcorn (*H.* [*A.*] *halepensis*), pearl millet (*Pennisetum glaucum*) [*P. typhoideum*], and foxtail (*Chaetochloa lutescens*) [*Setaria glauca*]. Inoculation experiments described by the author showed that the same organism was responsible for the leaf spot on all these hosts.

On maize the disease is characterized by the development of round, elliptical, or irregular lesions, dark green at first, later brown-centred with a somewhat darker brown to reddish-brown narrow border. Marginal infection often results in long necrotic areas along the edge of the leaf. The lesions on the species of *Andropogon* were similar in shape to those on maize, but were light-centred and red-bordered, except on *A. sorghum* var. *shallu*, in which their borders were dark brown, while on *P. typhoideum* and *Setaria glauca* the spots were uniformly dark brown.

The causal organism is a white, fluorescent, cylindrical, flagellate bacterium, which the author has already described under the name *Bacterium holci* [*R.A.M.*, v, p. 547]. Its cultural and physiological characters are described in detail. It survived fifty days' freezing in water, sixty hours' drying on glass, and three months' drying on seed of *H. sorghum*, on or in which it was found capable of overwintering, while field observations indicate that it can also overwinter in the soil.

The group number according to the later chart adopted by the Society of American Bacteriologists is 5322–3112–2232 (according to the old chart 211·2323133).

The organism never occurred as abundantly in the lesions on the leaves of species of *Andropogon* as in those on leaves of maize and *P. typhoideum*. The occurrence of infection when suspensions of the organism were sprayed on the leaves without wounding the tissues is regarded as pointing to the likelihood of stomatal infection. The bacteria are at first apparently intercellular, but soon cause a collapse of the tissues and become intracellular. They appear to be rather quickly arrested in their development in the

tissues of species of *Andropogon*, possibly owing to some toxic substance produced in the injured tissue.

Seedling infection to the extent of 0·6 to 10·1 per cent. occurred in eleven out of twenty-five tests of sorghum seed-grain from diseased crops sown in sterile soil. There was no evidence that the causal agent is carried on maize seed, on which host initial infection is stated to come from the soil or from other hosts growing near. As control measures the writer suggests the selection of sorghum seed from fields free from the disease, the destruction of self-sown plants of susceptible species of *Andropogon* growing in or near maize fields, and crop rotation.

A bibliography of thirty-two titles is appended.

HARCOURT (F. G.). **Address delivered to the Agricultural and Commercial Society, Dominica, on Lime varieties in Dominica.** — Bulletin Office, Roseau, Dominica, 11 pp., 1927.

An account is given of the progress which has been made during the past few years in the development of varieties of West Indian limes resistant to withertip [*Gloeosporium limetticolum*: *R.A.M.*, v, p. 549]. Up to date 1,700 plants of new varieties have been distributed to 19 estates, and two experimental plots have been established with the objects: (1) of keeping the new varieties under constant observation; (2) of testing thoroughly the immunity of these varieties from withertip; and (3) of maintaining a sufficient supply of propagating material in the event of a particular variety being selected for extensive cultivation.

Brief descriptions are given of some of the more promising of the new introductions, together with information based on observations of their behaviour in Dominica. The Kusai lime is immune from withertip, but its late maturity is an undesirable feature, and the juice has been found unsuitable for the raw juice trade. Similar considerations apply in the case of the Rangpur lime. The Eustis limequat also appears to be immune from withertip, and as its fruits drop on ripening it is of some value in the work of selection. Woglum's round seedless lemon is very productive and apparently immune from withertip. The Woglum lime, which is more promising than any of the varieties enumerated above, drops its fruits almost as readily as the West Indian lime. It has a fair acid content (12 oz. per gall.) and the aroma of the expressed oil closely resembles that of the West Indian lime. This variety is also immune from withertip. The fruit of *Citrus hystrix* somewhat resembles that of the ordinary lemon. The acid content is fairly high (11·83 to 13·66 oz. per gall.) but the fruits appear to drop only when over-ripe. This species seems to be of little use in itself in Dominica, but may be valuable as a stock for other varieties. An excellent substitute for the West Indian lime may be found in the Tahiti lime, the juice of the two varieties being very similar. The Tahiti is apparently immune both from withertip and canker [*Pseudomonas citri*] and the juice has a good acid content (12·2 oz. per gall.). Bear's seedless lime is an improved variety of Tahiti. *C. aurantifolia* from the Trinidad Department of Agriculture is highly resistant to withertip and appears promising in other respects, though its juice is unsuitable for the raw juice trade of

Dominica. Other interesting varieties include the Trinidad Everglade which, though not immune from withertip, bears heavily under conditions destructive to the West Indian lime. Breeding work is also in progress with various other hybrids from the United States and Burma.

Attention is drawn to the fact that a considerable area remains on the Leeward coast where the West Indian lime could be profitably grown under improved cultural conditions.

FAWCETT (G. L.). **La gomosis o pie podrido de los Naranjos.** [Gummosis or foot rot of Oranges.]—*Rev. Indus. y Agric. Tucumán*, xvii, 7–8, pp. 166–171, 2 figs., 1927.

The symptoms of gummosis of orange trees are described and directions given for its control on the lines advocated by Fawcett and Lee [*R.A.M.*, v, p. 735]. Much damage has recently been caused by this disease in plantations of four- to eight-year-old trees in the Orán district (Argentine). The practice of raising trees from seed is stated to favour gummosis and should only be employed in very dry localities. Attention is drawn to a recent paper on gummosis in the Argentine [ibid., iv, p. 276] in which this disease is referred, on the present writer's authority, to *Phytophthora parasitica*. This, however, is incorrect, since in many cases the fungus was not present in affected trees and the author regards it as of secondary importance. The form of gummosis associated with *Pythiacystis* [*Phytophthora*] *citrophthora* [ibid., ii, p. 539] is unknown in the Argentine.

TINDALE (G. B.). **Cool storage of Washington Navel Oranges. Results of 1926 experiments.**—*Journ. Dept. Agric. Victoria*, xxv, 2, pp. 74–80, 1 fig., 1927.

The results of experiments [details of which are given] carried out in 1926 by the Victoria (Australia) Department of Agriculture showed that Washington Navel oranges may be kept in excellent condition in cool store at a temperature of 36° F. for periods up to three months. Careful handling during picking, sweating, and packing will prevent infection by the blue and green moulds (*Penicillium italicum* and *P. digitatum*), which are stated to be the most important enemies of the orange after picking. The fruit should be harvested immediately prior to maturity, every care being taken to avoid wounding the skin. The oranges should be carefully placed in cases (paper-lined if necessary) and sweated for a week to ten days in an open shed. Free circulation of air between the stacked cases is very important. Wrapping and packing should be carefully done on the lines advocated by the Department of Agriculture. Skin spotting or browning, followed by shrivelling, is a serious blemish believed to be due to picking the fruit in a moist condition.

SHERBAKOFF (C. D.). **A modified method of delinting Cotton seed with sulphuric acid.**—*Phytopath.*, xvii, 3, pp. 189–193, 1927.

Experiments carried out by the author in 1926 showed that cotton seed may be efficiently delinted by treating it for 5 or 10 minutes with a minimum quantity of concentrated sulphuric

acid (one part of acid to seventeen parts, by volume, of seed), or with a one in five dilution of the acid at the rate of one part of the dilution to ten parts, by volume, of the seed. These methods are claimed to effect a two-and-a-half and ten-fold economy, respectively, of the sulphuric acid needed, and to have no injurious effect on the germination of the seed. Further experiments showed that the washing of the treated seed may be advantageously replaced by liming. The main advantages of delinted seed are said to be its freedom from such seed-borne organisms [e.g. *Bacterium malvacearum*] as are liable to be entangled in the lint, and its more rapid germination.

TECHOUEYRES (E.) & PILLEMENT (Mlle). **L'Isaria densa et la lutte contre les vers blancs.** [*Isaria densa* and the campaign against cockchafers.]—*Comptes rendus Acad. d'Agric. de France*, xiii, 10, pp. 322–325, 1927.

In connexion with Le Moult's investigations on the pathogenic action of *Isaria densa* on cockchafer larvae [*R.A.M.*, ii, p. 412], the writers carried out a series of experiments in which cultures of the fungus on potato and beetroot media were placed on samples of soil from the vineyards of Champagne, in 30 glass containers, in order to test the viability of the fungus in soil. Half the containers were subjected to protracted sterilization at 120° C. before inoculation, and some were kept in the laboratory while others were placed in soil out of doors and thus exposed to frequent atmospheric variations.

The following results were obtained after eight months (February to September). On sterilized soil in the laboratory the fungus developed in all the vessels, and on sterile soil in the open in half. On unsterilized soil in the laboratory development occurred in half the vessels and on unsterilized soil in the open in three-quarters.

It is apparent from these experiments that *I. densa* is capable of retaining its viability in the calcareous soil of Champagne in face both of microbiological activity and of atmospheric fluctuations.

DUSTAN (A. G.). **The artificial culture and dissemination of Entomophthora sphaerosperma Fres., a fungous parasite for the control of the European Apple sucker (Psyllia mali Schmidb.)**—*Journ. Econ. Entom.*, xx, 1, pp. 68–75, 1 pl., 1927.

Further information is presented concerning the control in Nova Scotia of the European apple sucker, *Psylla* (*Psyllia*) *mali* [the life-history of which is described], by its fungous parasite, *Entomophthora sphaerosperma* [*R.A.M.*, v, pp. 93, 94].

The fungus overwinters in the resting spore stage, the spores being found in the bodies of dead insects adhering to the fallen leaves. In the late spring and early summer these resting spores germinate and probably give rise to conidia by means of which primary infection occurs. The examination of many parasitized insects shows that the fungus first develops in the blood stream of the host in the shape of noticeably short mycelial filaments, which are quite distinct from the stout hyphal bodies commonly found in

similar cases of blood infection. All parts of the insect are liable to invasion, including the head, thorax, abdomen, legs, and tarsi. The organism grows until the destruction of all the internal organs is complete and only a chitinous shell remains.

Shortly before this last stage of the disease, the insects lose their power of locomotion and either fall to the ground or settle on the under side of low growing leaves. At this point hyphal filaments begin to grow out through the integument. Most of the hyphae emerge through the dorsum and eventually form the conidiophores, but some grow through the ventral sides and form rhizoids which, aided by the beak and legs, attach the dead insects to the leaves. The hyphal filaments develop profusely, nearly always in a lateral direction, from all parts of the dorsum except a small area at the centre of the thorax. At maturity the fungus appears as a dense, flat mat of mycelium, spreading out radially from the dorsum of the insect and almost completely covering it. The mycelium is generally white or pale blue, but occasionally green or red specimens are encountered.

At first the hyphae are simple but as they elongate into conidiophores, a cluster of short, stout, irregular branches develops at the apex. One conidium is borne on each branch, whence it is shot into the air to infect other insects. Under favourable conditions successive generations of these summer spores may be produced throughout the season. The examination of dead insects showing no external symptoms of infection reveals the presence of resting spores in all parts of the body. The conditions inducing the formation of resting spores have not been fully investigated, but probably the necessary stimulus is provided by a lowering of the temperature or a brief period of dry weather. The mycelial elements giving rise to the resting spores are very rough and irregular, with wart-like protuberances, in marked contrast to the smooth, regular hyphae preceding the conidial stage. No sexual process was observed in spore formation.

An account is given of the methods employed for the artificial dissemination of the fungus, chiefly by rearing the insects on apple seedlings grown in covered cages of various types [loc. cit.]. By means of this equipment it was possible to start epidemics a month or six weeks earlier than under orchard conditions. The work of artificial dissemination has been greatly favoured by the extremely humid atmospheric conditions of the Maritime Provinces of Canada.

POLLACCI (G.) & NANNIZZI (A.). **I miceti patogeni dell' uomo e degli animali, descritti, delineati e preparati per l'osservazione al microscopio, con notizie sopra i rimedi per combaterli. Fasc. V.** [Fungi pathogenic to man and animals, described, delineated, and prepared for microscopic examination, with notes on remedial measures. Part V.]—Siena, Libreria Editrice Senese, 28 pp., 46 figs. (2 col.), 1926.

The fifth part of the Atlas of Pathogenic Fungi, in the compilation of which the authors are engaged, comprises short illustrated accounts, accompanied by prepared slides, of the ten following species: *Achorion gypseum, Beauveria bassiana, Cryptococcus der-*

matidis, *C. interdigitalis*, *Malbranchea bolognesii-chiurcoi* [*R.A.M.*, vi, p. 418], *Microsporon felineum*, *Monilia pinoyi*, *Sterigmatocystis ochracea* (*Aspergillus ochraceus*), *Trichophyton equinum*, and *T. radiolatum* (*T. gypseum*). A bibliography of 48 titles is included.

PERIN (A.). **Le micosi polmonari e generalità sui miceti patogeni.** [Pulmonary mycoses and a general survey of pathogenic fungi.]—v + 294 pp., 52 figs., Siena, Libreria Editrice Senese, 1925. [Received March, 1927.]

This is the first of a series of textbooks on human mycoses which are being written by specialists in various branches of medicine and surgery, under the general direction of Professor G. Pollacci of Siena. It starts with a general survey of pathogenic fungi, in which the classification followed is that of Castellani and Chalmers (Manual of Tropical Medicine, 3rd Ed., 1919); methods are given for the isolation, cultivation, and identification of the organisms, as well as a general outline of the therapeutics of mycoses as a whole.

The greater part of the volume deals with human pulmonary diseases caused by fungi. They are fully described under the following headings: mucormycoses, including the genera *Mucor*, *Lichtheimia* [*Absidia*], *Rhizomucor*, and *Rhizopus*; saccharomycoses; endomycoses, including the genera *Endomyces* and *Coccioides*; aspergillomycoses; mycoses caused by species of *Penicillium*, of which only one, *P. crustaceum*, has been recorded as occasionally pathogenic; broncho-anaermycoses (*Anaeromyces bronchitica*); nocardiases [a term which the author, on taxonomic grounds, prefers to actinomycoses], including the genera *Nocardia* (*Actinomyces*) and *Cohnistreptothrix*; mycoses caused by species of *Cryptococcus* and *Monilia* [? *Candida*: *R.A.M.*, iii, p. 556]; oidiomycoses; hemisporoses; sporotrichoses; mycosis caused by *Acremoniella perinii*; and thrush, the causal organisms of which belong to the genera *Monilia* [? *Candida*], *Oidium* [*Oospora*], *Hemispora*, and *Endomyces*. In each case a brief account of the synonyms, morphology, and physiology of the various organisms is given, and the clinical aspect of the diseases caused by them is discussed at length. An extensive bibliography is given in the form of footnotes.

KELLER (P.). **Zur Klinik der Hyphomykosen, insbesondere der dyshidrosiformen Epidermophytien. Zugleich ein Beitrag zur regionären Verbreitung der Hyphomyzeten: die Pilzflora Oberbadens.** [On the clinical treatment of the hyphomycoses, especially of dysidrosiform epidermophytes, being simultaneously a contribution to the regional distribution of the hyphomycetes: the fungous flora of Upper Baden.]—*Dermatol. Zeitschr.*, xlix, pp. 33–51, 1926. [Abs. in *Bull. Inst. Pasteur*, xxv, 3, pp. 116–117, 1927.]

Of the 194 cases of dermatomycosis examined at the University Clinic at Freiburg-im-Breisgau, successful cultures were obtained in 138, distributed as follows: 36 cases of microsporosis, including 9 cutaneous and 4 of the scalp due to *Microsporon audouini* (stated to be very rare in adults); 2 of favus due to *Achorion gypseum* [*R.A.M.*, v, p. 555]; 6 of inguinal epidermophytosis, 4 being due to *Epidermophyton rubrum* and 2 to a fungus apparently with close

affinities to both *E. rubrum* and *E. lanoroseum*; 27 of dysidrosis of the hands and feet, the former being affected exclusively by blastomycetes and the latter by Kaufmann-Wolf's fungus (allied to *Trichophyton gypseum* and *T. interdigitale*); 55 of trichophytosis, *T. gypseum* predominating in rural and *T. cerebriforme* in urban patients, while *T. persicolor*, *T. ochraceum*, and *Achorion quinckeanum* were also isolated; 3 of thrush; 7 of superficial blastomycosis; and 2 of sporotrichosis due to *Sporotrichum beurmanni*.

SARTORY (A.) & SARTORY (R.). **Les teignes exotiques.** [Tropical ringworms.]—*Rev. Prat. Malad. des Pays Chauds*, vi, 5, pp. 265–276, 1926. [Abs. in *Trop. Dis. Bull.*, xxiv, 6, pp. 441–442, 1927.]

Dermatomycoses are stated to be very common in warm countries, and the authors record ten named and one unnamed species of *Trichophyton*, three of *Microsporon*, three of *Epidermophyton*, besides some of *Endodermophyton* or allied forms. *Achorion* is stated to be scarcely known in hot countries, though *A. gallinae* was isolated from a case of ringworm contracted in the French colonies.

BROCQ-ROUSSEU, URBAIN (A.), & BAROTTE. **Sur l'électivité cutanée des teignes animales, quelle que soit leur voie d'introduction dans l'organisme.** [On the cutaneous electivity of animal ringworms, irrespective of their mode of introduction into the organism.]—*Comptes rendus Soc. de Biol.*, xcv, 29, pp. 966–967, 1927.

Ringworm may be experimentally produced by inoculating an infected hair or a fragment of culture into the skin. The other customary methods of inoculation (subcutaneous, peritoneal, &c.) seldom lead to the development of ringworm fungi. All the authors' experiments on guinea-pigs, using these last methods, gave negative results, except those carried out in the dorsal region with very virulent cultures of *Trichophyton gypseum* and *T. equinum* [*R.A.M.*, v, p. 738] finely emulsified in physiological water and filtered on cotton.

DE MAGALHÃES (O.) & NEVES (A.). **Essays on mycology. Contribution to the study of fungi in Bello-Horizonte.**—*Memorias do Inst. Oswaldo Cruz*, xix, 2, pp. 245–322, 36 pl. (1 col.), 1926. [Portuguese and English.]

The characteristics of the following fungi (mostly isolated and grown in cultures) obtained from patients at the Santa Casa Hospital, Bello-Horizonte (Brazil), are described, and clinical details are given of the various pathological conditions associated with their presence.

Endomyces albicans was isolated from the sputum of children in 20 cases, and was frequently associated with *Oidium brasiliense*. The latter was found in forty cases, causing lesions, especially in the lungs, resembling those of tuberculosis. Treatment with iodides proved effectual.

In 31 cases of sporotrichosis the species concerned was always *Sporotrichum beurmanni*. Most of the attacks resulted in lym-

phangitic lesions, in which spores of the fungus were often difficult to find. Pleomorphism in the cultures was observed, and Davis's conclusions as regards colour and other changes [*R.A.M.*, i, p. 352] were confirmed. Direct isolation from the lesions was found to be the most satisfactory method of diagnosis, although spore-agglutination tests gave a reasonable number of positive results.

The observations on *Malassezia furfur* are based on about 16 cases of pityriasis versicolor, but even when the fungus was plentiful the authors failed to obtain cultures.

Epidermophyton inguinale (eight cases) is associated with a form of eczema; only four cultures were obtained, and septate hyphae with terminal and intercalary chlamydospores were detected.

In the only case of tinea barbae observed the causal organism was identified as *Trichophyton equinum*.

The *Microsporon* infections included 18 cases of *M. lanosum*, five of *M. audouini*, and a single case of *M. felineum*, all causing ringworm in children below twelve years of age.

In the four cases of favus studied, characteristic cultures of *Achorion schönleini* were obtained on Sabouraud's medium with glucose, malt-sugar, or molasses. Pleomorphic forms were never seen. Four cases of *A. gallinae* on fowls were also diagnosed.

The disease caused by *Aleurophora benigna* [ibid., vi, p. 356] is allied to pityriasis. Its occurrence is evidently not common.

Six cases of blastomycosis and five of infection by *Trichosporum hortai* were also examined.

ONORATO (R.). **I micetomi in Tripolitania.** [Mycetoma in Tripolitania.]—*Arch. Ital. Sci. Med. Colon* (*Tripoli*), vii, 1–2, pp. 1–8; 3, pp. 33–50; 4–5, pp. 65–83; 6, pp. 97–110; 7, pp. 137–152, 1926. [Abs. in *Trop. Dis. Bull.*, xxiv, 6, pp. 443–445, 1927.]

Notes are given on the classification by clinical and pathological characters of the various types of mycetoma, and a classification by the organism concerned in producing the disease is suggested in preference to those based on clinical or regional characters. Mycetoma is subdivided into two main groups, hyphomycetoma and micromycetoma. Of the 17 cases described in detail by the author, six belonged to the former group, and were associated with *Sterigmatocystis* [*Aspergillus*] *nidulans*, *Madurella mycetomi*, *M. tozeuri* (two cases), *M.* sp., and an undetermined eumycete with black granules. The remainder belonged to the micromycetoma group and were associated with *Nocardia* [*Actinomyces*] *indica* (3 cases), *N.* [*A.*] *convoluta*, *N.* [*A.*] sp., *Cohnistreptothrix israeli*, *C. thibiergii*, *C.* sp., and three undetermined fungi, two with white or yellow, and one with red granules.

Infection arises from injury by splinters of wood, thorns, fragments of grasses, and similar objects on which the organism is saprophytic. Particulars are given of the morbid anatomy and histology of the disease, with notes on its relation to age and sex, on the parts of the body chiefly affected, and on treatment.

T. (F. E.). **Sprue in children.**—*Journ. Trop. Med. & Hygiene*, xxx, 2, pp. 23–24, 1927.

In connexion with some general observations on the nature,

etiology, and distribution of sprue, the writer cites a rare case of this disease in a girl of six, recently reported from the United States (*Amer. Journ. Med. Sci.*, clxx, p. 364, 1925). Details are given of the patient's condition, which is stated to have been definitely shown to be associated with infections by Ashford's *Monilia psilosis*, this organism being regarded by the writer as the cause of the disease [but see *R.A.M.*, vi, p. 32]. Various successful methods of treatment are described, including the application of a vaccine prepared from cultures of the fungus on Sabouraud's medium.

SCOTT (J. A.). **Oidiomycosis of the nails.**—*Brit. Journ. of Dermatology*, xxxix, 3, pp. 119–122, 1 pl., 1927.

A case of oidiomycosis of the nails in a female patient aged 35 is reported in some detail. Scrapings from the brownish, clay-like material below the affected nails showed the presence of actively budding, yeast-like bodies. Isolations on Sabouraud's medium gave a similar organism, growth being slow at room temperature. After several sub-cultures the white, glistening colonies turned yellow. In older cultures a branched, septate mycelium developed, the hyphae of which generally ended in ampulliform swellings. Cases of mycelial degeneration in old cultures are briefly described, the hyphae segmenting into chains of clear, ballooned cells, at least twice the diameter of the normal organism and arranged like a necklace. The fungus is considered to be an *Oidium* [*Oospora*] and the case is believed to be the first record of oidiomycosis of the nails. Particulars are given of a successful method of treatment.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Au sujet de la virulence de l' 'Aspergillus fumigatus' Fresenius.** [On the subject of the virulence of *Aspergillus fumigatus* Fresenius.]—*Bull. Acad. Méd.*, Sér. 3, xcvii, 6, pp. 187–190, 1927.

Inoculation experiments on pigeons and guinea-pigs with *Aspergillus fumigatus* [*R.A.M.*, vi, pp. 95, 96, and next abstract] produced gradual symptoms comparable in all respects to those of true tuberculosis. Cultures from ascospores were found to possess an accentuation of virulence as compared with those derived from conidia. It was found possible to immunize susceptible individuals with dilute doses of the inoculum.

STORM VAN LEEUWEN (W.) & KREMER (W.). **Schimmelpilzallergene als Krankheitsursachen.** [Mould allergens as causes of disease.]—*Klin. Wochenschr.*, vi, 9, pp. 408–411, 1927.

The writers have continued their studies at Leiden, Holland, on the production by *Aspergillus fumigatus* and other moulds of the so-called 'allergens', i.e., substances capable of inducing pathological reactions in hypersensitive individuals [*R.A.M.*, v, p. 428]. Cultures of a number of strains of *A. fumigatus*, *A. flavus* from oats, *A. nidulans* from house dust, *A. oryzae*, a species of *Penicillium*, two species of *Mucor*, and *Bacterium* [*Bacillus*] *subtilis* were tested. They were grown on damp grain, fruit juice with gelatine, damp wallpaper with an admixture of starch, damp mattress stuffing, and the like.

Subcutaneous and intracutaneous injections with filtered extracts of these cultures induced a higher percentage of reactions in hypersensitive than in normal subjects, and the intensity of the symptoms was correspondingly greater in the former class. It is thought that the so-called 'climatic allergens' (i. e. those predominating in damp climates) produce certain constitutional modifications which render even normal individuals somewhat susceptible to their influence.

The smallest dose which produced general pathological symptoms in hypersensitive individuals was 1 : 10,000,000 of a standard extract; at 1 : 100,000 such generalized symptoms were common. The first special symptoms occurring as a result of subcutaneous injection were sneezing and *rhinitis vasomotoria*, frequently accompanied by headache and slight indisposition. These symptoms of a common cold frequently precede an improvement in the condition of asthmatical patients. The therapeutical dose of a standard extract would appear to lie below 1 : 100,000. Intracutaneous injections produced a marked irritation of the skin in hypersensitive subjects.

It was shown by experiments [details of which are given] that the blood of hypersensitive individuals contains substances which can specifically transmit climatic allergy to normal persons, and also substances capable of arresting the action of the allergens.

Some general aspects of the problem of allergy and anaphylaxis are discussed.

AVERNA-SACCÁ (R.). **Contribuiçao paro o estudo das molestias cryptogamicas das Roseiras.** [Contribution to the study of the fungous diseases of Roses.]—*Secretaria da Agric., Comm. e Obras Publicas, São Paulo*, 67 pp., 26 figs., 1926.

In this paper a description is given of the symptoms and life-history of the fungi causing diseases of roses in Brazil, with directions for their control.

The following are the most destructive, and are said to be very prevalent. Rust (*Phragmidium subcorticium*), mildew (*Sphaerotheca pannosa*), and *Marssonia* [*Diplocarpon*] *rosae*, all of which are especially found in damp, shaded situations and where farmyard manure has been applied in excess; lists are given of varieties of roses classified according to order of resistance to these fungi; leaf spot, caused by *Cercospora rosaecola*, which attacks all varieties, including the wild *Rosa centifolia*, and is most frequent at the end of the hot season.

Numerous other fungi have been found to cause trouble in certain gardens. *Myiocopron* (?) sp. was first seen on pineapple leaves, and then on roses at Piracicaba. The twigs attacked are covered with small, blue-black blotches, and the fruit bodies develop as rounded scabs, 0·5 to 1 mm. in diameter, with a flattened, fibrillose margin and almost cupuliform centre, showing a large rounded ostiole; asci irregular in shape, 54 to 67·5 by 21 to 27 μ in diameter, thick-walled, with paraphyses; spores hyaline and 18 to 19 by 9·5 to 10·8 μ. This fungus is stated to be almost invariably associated with *Botryosphaeria dothidea* and *Eutypella prunastri*, both of which are described in detail.

A serious form of leaf spot caused by *Sphaerella rosigena* was

found on several cultivated varieties in Santos and Guaruja. A species of *Leptosphaeria* was frequently associated with this fungus in the damp summer heat and caused defoliation. *Phyllachora impressa* also causes defoliation on damp soils. A bark blotch is referred to a species of *Cucurbitaria*, which caused severe damage to some rose bushes in May, 1923. *Ottia rosae* was found on tea rose (*Rosa thea*) and dog rose (*R. canina*) in shaded and damp situations; pycnidia of *Diplodia rosarum* were associated with this fungus. Anthracnose (*Gloeosporium rosae*) occurred in a rose garden at Piracicaba; *Leptothyrium rosae* was sometimes associated with it. *Dendrophoma pleurospora* f. *rosiflorarum* attacked roses vigorously in the coastal areas. *Pestalozzia littoralis* was also found in this region. A *Stilbum* is reported to cause discoloration and rot; the synnemata have orange or dark red heads and bear elliptical, hyaline spores with a thin wall. *Sphaeropsis rosarum* occurs either alone or with *B. dothidea* on new twigs. *Colletotrichum rosarum* and *Phomopsis rosae* were also seen on newly formed twigs. A *Fusarium* was found on receptacles which became blackened; it had hyaline, pointed, at first continuous and then septate conidia, measuring 30 to 60 by 3·3 to 4 μ.

Two new species are described. *Euryachora rosicola* n. sp. was seen first in 1921 on a few bushes, but spread subsequently, attacking an entire nursery. The twigs are covered with large, marginate, livid spots, which increase in size, extending to the base and thence to the stem, and turn reddish-brown or ashen-grey. Longitudinal splits are seen in the bark, and stromata with ascospores are exposed. Affected twigs die back, but suckers are often produced, though they do not usually develop far. The affected tissues contain septate, branched hyphae, at first hyaline, then grey or fuliginous; the stromata are irregular, pseudoparenchymatous, and dark-coloured; the asci are claviform, short-stalked, and 94·5 to 108 by 27 μ; and the eight ascospores are distichous, navicular, 43 to 45·9 by 18 to 19 μ, at first hyaline, then greenish, and finally fuliginous.

Hendersonia rosicola n. sp. was found in 1926 on the twigs of a few recently pruned bushes. Large regular spots or livid rings are formed, which, increasing in size, spread to the stem, and cause wilting. Later the colour becomes darker, and abundant fruiting bodies are visible. A hyaline, delicate, septate, branching mycelium is found in the bark and wood. The acervuli are globose, lenticular, or pyriform, and are immersed in the cortical tissue, and the spores are hyaline, cylindrical, ovate or elliptical at the apex, ultimately 3-septate, green, and 9 to 13 by 13·24 to 14·85 μ in diameter.

The other fungi mentioned are stated to be of minor importance.

FLACHS. **Weitere Beschädigungen an Azaleen durch Acalla schalleriana L. und Pestalozzia spec.** [Further injuries to Azaleas from *Acalla schalleriana* and *Pestalozzia* sp.]—*Blumen und Pflanzenbau*, xlii, 7, p. 94, 2 figs., 1927.

A brief account is given of a disease of azaleas imported into Germany from Belgium in 1925. The plants became sickly and showed a discoloration of the leaves, most of which fell off. After 14 days in a damp chamber at 25° C. fructifications containing fusiform spores, measuring 22·5 to 27·5 by 7·5 μ, of a fungus closely

resembling *Pestalozzia guepini*, developed on the leaves. The spores of the azalea fungus are usually five- (sometimes four-) celled, the middle cells being dark olive-brown and thick-walled, and they are constricted at the septa. It is thought to be possibly a biological strain of *P. guepini*, which is stated to occur in its typical form only on *Camellia* [*R.A.M.*, i, p. 413], but to be found with slight variations on several other hosts.

MAAS (J.). **Germisan gegen den Vermehrungspilz.** [Germisan against the propagation fungus.]—*Gartenwelt*, xxxi, 12, p. 179, 1927.

Excellent results in the control of *Moniliopsis aderholdi* on ferns (*Pteris*) have recently been obtained by sprinkling a few grains of germisan dust over affected patches in the frame. In severe cases a small quantity of the dust should be dissolved in water, and the mixture sprinkled over the whole frame. A slight initial check to the growth of treated plants was observed, but this was of brief duration, and the general outcome of the treatment was decidedly satisfactory.

VAN BEYMA THOE KINGMA (F. H.). **Ueber eine Botrytis-art auf Rotkleesamen, Botrytis trifolii nov. spec.** [On a species of *Botrytis* on Red Clover seed, *Botrytis trifolii* n. sp.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten', Baarn (Holland)*, x, pp. 37–39, 5 figs., 2 graphs, 1927.

During the winter of 1925–6 the writer examined a species of *Botrytis* which was very prevalent on red clover [*Trifolium pratense*] seed in 1923. The fungus was found to differ in various respects from *B. cinerea*, and is named *B. trifolii* n. sp. According to the diagnosis (in German) the clover fungus is characterized by a septate, hyaline, often finely granular mycelium, the hyphae generally measuring 5 to 8 μ in diameter, with typical clavate swellings. The conidiophores are short (up to 0·2 mm. long and 5 to 7 μ broad), septate, with branches measuring 10 to 18 μ in length and 7 to 12 μ in breadth. The hyaline, globular to elongated, irregular conidia measure 7 to 25 by 4 to 9 μ (chiefly 15 to 19 by 6 to 7 μ), and are often arranged in a whorl of 4 to 12 round the apex of the conidiophore. Bicellular conidia were also observed. The fungus developed slowly on beerwort, cherry, or peptone agar, and made little growth on starch-containing media. Sclerotial formation did not occur.

MONTEITH (J.) & HARMON (T. C.). **Fungicidal control of brown-patch of turf.**—Abs. in *Phytopath.*, xvii, 1, p. 50, 1927.

Continued experiments in the control of brown patch disease of turf [*Rhizoctonia* spp.: *R.A.M.*, v, p. 742] again confirmed the efficacy of mercury compounds [a list of which is given], the results indicating that the degree of control obtained was largely dependent on the amount of mercury present. The most satisfactory was found to be mercurous chloride, both because of its low toxicity to grass and of its relatively low cost. Black mercuric sulphide was ineffective, probably owing to its insolubility in the soil acids. Silver nitrate gave control similar to that of mercury salts. Re-

peated applications of copper compounds (copper sulphate, Bordeaux mixture, copper stearate) resulted in an accumulation of copper in the soil which proved extremely toxic to the roots. Several other fungicides tested also proved to be injurious.

JONES (F. R.) & GRANOVSKY (A. A.). **Yellowing of Alfalfa caused by leafhoppers.**—Abs. in *Phytopath.*, xvii, 1, p. 39, 1927.

Experiments carried out in 1926 at the Wisconsin Experiment Station have established that the leafhopper *Empoasca fabae* is responsible for the diseased condition of lucerne termed 'yellows', which is stated to have been exceptionally conspicuous locally in late June and early July, 1926, on the second crop in Wisconsin. Further study of the disease is in progress at the Station.

HALLOWELL (E. A.), MONTEITH (J.), & FLINT (W. P.). **Leafhopper injury to Clover.**—Abs. in *Phytopath.*, xvii, 1, p. 58, 1927.

Experiments carried out in 1926 at Urbana, Illinois, apparently showed that the leafhopper *Empoasca mali* is responsible for a diseased condition, resembling tipburn or hopperburn of the potato, which was very prevalent in that year on clovers and other leguminous crops in the United States. Relatively glabrous clovers, such as English and Italian varieties, appeared to suffer more from the attacks of the insect than the native, hairy forms. There was evidence that Bordeaux sprays repelled the insect, the plants thus treated remaining vigorous, while the controls were dwarfed. Lucerne at Arlington Farm, Virginia, where numerous species of leafhoppers were abundant, was severely dwarfed, and had the typical 'yellows' or 'yellow top' appearance [see preceding abstract].

LAUBERT (R.). **Altes und Neues über das Apfel- und Birnen-Fusicladium und seine Bekämpfung.** [Old and new facts concerning Apple and Pear *Fusicladium* and its control.]—*Obst- und Gemüsebau*, lxxiii, 6, pp. 84–85, 1927.

A brief description is given in popular terms of the symptoms of apple and pear scab (*Venturia inaequalis* and *V. pirina*), together with notes on their mode of infection, varietal susceptibility, and the like. For winter treatment (applicable every four to five years) the writer recommends 5 or 10 per cent. carbolineum, 20 to 25 per cent. lime-sulphur, 5 per cent. niva-xex, or a solution of 2 per cent. carbolineum and 4 per cent. calcined soda. For the three or more summer applications, 2·5 per cent. lime-sulphur should be used.

HEESE (H.). **Richtige Bekämpfung des Fusicladiums erhöht die Qualität der Früchte.** [Correct control of *Fusicladium* improves the quality of the fruit.]—*Obst- und Gemüsebau*, lxxiii, 6, p. 86, 1927.

Excellent control of apple scab (*Fusicladium*) [*Venturia inaequalis*] has been obtained in the Moselle Valley by six applications (between 10th April and 21st August) of Bordeaux mixture with the Rapid motor spraying apparatus (C. Platz, Ludwigshafen). The yield of marketable fruit was increased by 48 per cent. over that of 1923 and 1924. This success is largely attributed to the motor sprayer, which has also been very successfully employed against potato blight (*Phytophthora infestans*).

KOHL (E. J.). **Details in the life-history of the Apple blotch fungus.**—Abs. in *Phytopath.*, xvii, 1, pp. 45–46, 1927.

Observations made during 1925 and 1926 in Indiana showed that infection of apple trees with the apple blotch fungus [*Phyllosticta solitaria*] occurred during each rainy period from 5 days to 8 weeks after petal fall. As shown by an experiment in which one-year-old, potted Duchess apple trees were placed under a diseased tree, and removed immediately after each rain, the period of incubation lasts from 20 to 24 days, being somewhat shorter on the leaf blade than on the petiole. The mycelium of the fungus was found to be intercellular and confined to the collenchyma layer, in which it was traced into the abscission layer at a considerable distance below the visible margin of the lesion on the petiole. The spores that germinated on leaves formed appressoria, while none were formed when the spores were germinated in water on slides, though they adhered closely and could be washed off only with difficulty.

GARDNER (M. W.). **Apple blotch canker eradication.**—*Phytopath.*, xvii, 3, pp. 185–188, 1927.

The efficacy of the method described by the author [*R.A.M.*, iii, p. 277] for the control of apple blotch canker (*Phyllosticta solitaria*) by early canker eradication was proved by the case, described in detail, of two young orchards of the very susceptible variety Oldenburg at Vincennes, Indiana, where the fruit in blocks of trees thus treated, but left unsprayed in 1925 and 1926, was absolutely free from blotch lesions. This result also indicates, in the author's opinion, that unlike the apple scab fungus [*Venturia inaequalis*], the blotch fungus is not usually disseminated over long distances or from orchard to orchard by the wind or other natural agencies, and that its occurrence in an orchard is dependent on whether or not it was present on the nursery stock used for the plantation.

SWARTWOUT (H. G.). **Blister and black rot cankers.**—*Missouri Agric. Exper. Stat. Bull.* 248, 15 pp., 13 figs., 1927.

Blister canker (*Nummularia discreta*) and black rot of apples (*Physalospora cydoniae*) are stated to cause very heavy damage in Missouri, the former being especially severe in Ben Davis and Gano orchards, while the Duchess and York varieties are highly resistant. The symptoms of both diseases are described. The dissemination of the spores of *N. discreta* first occurs in Missouri about 1st May, while those of *P. cydoniae* are liberated as early as 1st April. Directions are given for the control of the cankers by light pruning, thorough cultivation, and the application of a protective dressing of white lead and linseed oil plant mixed with corrosive sublimate dissolved in denatured grain alcohol. Tanglefoot dissolved in alcohol has also given promising results [cf. *R.A.M.*, v, p. 149] but grafting wax and sodium silicate have been found ineffectual.

DUTTON (W. C.). **Notes on some of the newer spray materials.**—*Michigan Agric. Exper. Stat. Quart. Bull.*, ix, 3, pp. 117–120, 1927.

Notes are given on the advantages and disadvantages of some of

the plant sprays offered to the grower as substitutes for those recommended in the spraying calendar for fruits [*R.A.M.*, iv, p. 485] issued by the Michigan Agricultural Experiment Station, and on the conditions under which they can be used safely.

Dry lime-sulphur varies somewhat in composition, but on the average four pounds are required to equal one gallon of liquid concentrate. There is no evidence that it is any more effective per unit of active ingredients than the standard liquid form.

Of other sulphur compounds, B.T.S., a compound of barium and sulphur, cannot yet be recommended owing to insufficient data. Sulfocide, a compound of sodium and sulphur, is not recommended for general use. Soluble sulphur, another sodium sulphur compound, has generally given satisfactory results in the control of peach curl [*Taphrina deformans*], but should not be used for summer applications on any kind of fruit. Little information is available about sulphurette, another similar compound.

The dry-mix sulphur-lime spray, a mixture of sulphur, hydrated lime, and a casein spreader, which in the orchard is mixed with water and used as a spray, is the standard fungicidal spray for summer applications on peaches and Japanese plums, but cannot be considered the equal of lime-sulphur for the control of apple scab [*Venturia inaequalis*], although it is not likely to cause foliage injury or russeting of the fruit. It might be advantageously substituted for lime-sulphur after the calyx or petal-fall application, provided the first attacks of scab have been thoroughly controlled by early sprays of lime-sulphur. Wettable sulphur is possibly about as effective as dry-mix; if used with lead arsenate the addition of lime is advisable to reduce foliage injury.

The casein spreader is a mixture of finely powdered casein and hydrated lime. It is not a satisfactory substitute for resin fish-oil soap in grape spraying, but may be used to advantage with lime-sulphur in the delayed dormant application on dewberries [*Rubus* spp.] and raspberries. Its general use with lime-sulphur and lead arsenate on apples is not advised.

Notes are also given on some of the advantages and disadvantages of dusting as compared with spraying.

MAGNESS (J. R.), DIEHL (H. C.), & HALLER (M. H.). **Picking maturity of Apples in relation to storage.**—*U.S. Dept. of Agric. Bull.* 1448, 19 pp., 1 col. pl., 1 fig., 1926. [Received June, 1927.]

Susceptibility to storage scald or internal breakdown is an important factor in determining the best time to pick different varieties of apples [cf. *R.A.M.*, vi, p. 301]. Susceptibility to water core on the trees [ibid., iv, p. 419], the amount of red colour developed, the size of the fruit, and the tendency to drop are all important considerations. The most reliable indications of picking maturity are thought to be firmness of the flesh of the fruit, the amount of yellowing in the unblushed portions, and the tenacity with which the apples cling to the tree. The factors involved in a determination of the best time for picking, and the stage of maturity found to give most satisfactory storage and market fruit, are discussed in detail for the majority of commercial storage varieties, e. g., Arkan-

sas, Baldwin, Delicious, Grimes Golden, Jonathan, Winesap, Yellow Newtown, and York Imperial.

HEPPNER (M. J.). **Study of Bartlett Pear black-end undertaken in California.**—*Science*, N.S., lxv, 1681, pp. 280–281, 1927.

An extensive study of black-end of Bartlett pears, a physiological disease which has been causing heavy losses of recent years in California, has been undertaken by the Division of Pomology of the College of Agriculture at Davis.

The first symptom of black-end, developing when the fruit is quite small, is a shiny and tight appearance of the epidermis near the calyx end, the calyx lobes being forced out and seeming to be set on top of a peak. With advancing maturity, the calyx end either turns black or becomes very hard and gritty. In either case the fruit is commercially valueless.

Black-end has been found to occur almost exclusively on Bartlett pears grafted on the Japanese stock (*Pyrus serotina*), the French stock, *P. communis*, only being affected in very heavy, wet soils. There would thus appear, from these preliminary investigations, to be a connexion between the disease and the variety of stock used in grafting.

EZEKIEL (W. N.). **Fruit-rotting Sclerotinias. III. Longevity of buried brown-rot mummies.**—*Maryland Agric. Exper. Stat. Bull.* 284, 22 pp., 3 figs., 1927.

The experiments described in some detail in the present bulletin, and which were made over a period of several years, were planned to test the longevity, when buried at various depths in the soil, of the American brown rot fungus *Sclerotinia americana* [*S. cinerea* f. *americana*: *R.A.M.*, iv, p. 508; v, p. 108] in mummified peaches. The results established that, under conditions comparable to those prevailing in orchards, such mummies (buried at depths varying from two to eight inches) consistently disintegrated in less than ten months to a sufficient degree to prevent the formation of apothecia, thus confirming the efficacy as an auxiliary control measure of the usually recommended ploughing-in of the mummies in the orchards. This applies only in part to plum mummies which, in preliminary experiments, were found to be more durable than peach mummies, and does not apply to the fruit rotted by *S. cinerea* [European forms], as in the latter case apothecia are apparently produced but rarely, and the disease seems to be perpetuated chiefly by conidia produced on diseased twigs and on fruit clinging to the trees. The ploughing-in of the mummies should be made in the autumn or in the spring before the early 'pink bud' stage of the blossoms.

FAES (H.) & STAEHELIN (M.). **Les champignons et les insectes ennemis du Cerisier.** [The fungus and insect pests of the Cherry.]—*Annuaire Agric. de la Suisse*, xxviii, pp. 1–27, 14 figs. (1 col.), 1927.

An account is given of the authors' observations and studies, at

the Federal Viticultural Station at Lausanne, on the cherry diseases caused by *Clasterosporium carpophilum* [*Coryneum beijerinckii*], *Sclerotinia cinerea*, and *Gnomonia erythrostoma*.

Cultures of *C. beijerinckii* produced branched conidiophores bearing fusoid, septate conidia in a few days. Inoculations with conidia from infected leaves were successful whether the upper or under surface of the leaf received the inoculum. As stomata are absent from the upper surface, it is concluded that penetration is direct and not through the latter. Spots were visible in from 4 to 14 days. Successful infection was only obtained under moist conditions, and the older leaves were decidedly resistant to attack.

In laboratory tests a yellow spot appeared at the point of penetration. Later this turned brown, but was never surrounded by the small red zone so characteristic in the open-air attack. Spores did not develop in these laboratory tests.

Artificially infected cherries displayed similar characteristics to those attacked on the tree, but the spots again lacked the reddish-yellow border. On the other hand, spores developed freely on the fruit. The fungus was found to penetrate directly through the skin of the fruit, the mycelium destroying the cells and their entire contents. On the tree the infected fruit is frequently mummified and remains attached to the tree. Re-infection of the new growth in the spring by spores developing on these fruits was found to occur. The attack is usually much more severe in the lower parts of the tree, near the soil, the upper leaves and fruit often escaping. This is probably due to hibernation of the fungus on fallen leaves and fruit. A comparison of the severity of the attack over a number of years showed that a wet spring favours the disease.

In years favourable to the disease, not only was the amount of wood formed on the branches and trunk of the tree found to be subnormal, but there was a deficiency of new terminal branches as well as of fruit buds, and the fruit was either very small or fell off.

Control by spraying with 1 per cent. Bordeaux mixture immediately after the fruit forms is recommended, only the lower 2 or 3 m. of the tree being sprayed in order to form a protective barrier. A second application may be given a week later.

Sclerotinia cinerea penetrates the style of the flower, sometimes also the stamens or perianth, and kills the ovary, then extends into the pedicel and the flower spurs, killing them in turn. It can also attack and kill the leaves and, given favourable meteorological conditions, the fruit. The cherry, plum, and *Prunus mahaleb* are all susceptible. In the winter all the branches killed in the preceding year should be pruned off and burnt, and any diseased fruit removed. The tree should then be sprayed with a 25 per cent. solution of lime-sulphur.

Gnomonia erythrostoma, which is usually more prevalent in the north than in the south of the country, attacked cultivated and wild cherry trees near Lausanne in May, 1925. Given favourable meteorological conditions, the fungus may prove as injurious as *C. beijerinckii*. The diseased leaves should be collected in the winter and burnt.

HÖNINGS (J.) & MACHERAUCH (O.). **Mehltaufeste Stachelbeeren.** [Gooseberries resistant to mildew.]—*Prakt. Ratgeber im Obst- u. Gartenbau*, xli, pp. 386–387, 1926. [Abs. in *Centralbl. für Bakt.*, Ab. 2, lxx, 1–7, p. 176, 1927.]

The only gooseberry varieties found to have much resistance to mildew [*Sphaerotheca mors-uvae*] are certain small, red-berried ones, e.g., American mountain gooseberries (Mountain Seedling, Rumbullion, Houghton, Downing, Small Red Globe, and Red Jacket). Some varieties are susceptible to injury from lime-sulphur, but Höning's Früheste will stand very concentrated applications. Erect varieties have been found less susceptible than those with low growing foliage. In the autumn the bushes should be pruned heavily and the soil well limed; a 2 per cent. solution of ferrous sulphate should be applied when the shoots begin to appear. Some resistance is shown by the varieties Rote Preiselbeere, Crown Prince, Red Orleans, May Duke, Grüne Flaschenbeere, Lady Delamere, Höning's Früheste, Macherauch's Sämling, and Weisse Volltragende.

ERICSON (A. L.). **Wieder ein Mittel gegen Stachelbeermehltau.** [Another remedy for Gooseberry mildew.]—*Obst- und Gemüsebau*, lxxiii, 6, p. 94, 1927.

Excellent results are stated to have been obtained in Sweden of recent years by the application of 6 to 7 per cent. glycerine soft soap solution for the control of American gooseberry mildew [*Sphaerotheca mors-uvae*: *R.A.M.*, ii, p. 457]. This preparation is only effective against the 'white' stage of the fungus, and should therefore be applied in the spring or early summer.

RANKIN (W. H.). **Mosaic of red and black cultivated Raspberries.** —Abs. in *Phytopath.*, xvii, 1, p. 46, 1927.

Mosaic is stated to be the most important virus disease of the red and black cultivated varieties of raspberry in New York State, and to have been proved to be identical in both sorts. It is believed to be spread almost entirely by the passive dispersal by wind, rain, or cultivation operations of the principal aphid carrier (*Amphorophora rubi*), and a biological relation between the aphid and the infective principle is indicated from the fact that only the first and second instars of the aphid are apparently able to start the infection.

The extreme variability of the degree of control attained in New York by the use of healthy stocks and roguing appears to be dependent on the relative abundance of the insect vector, the varying frequency and intensity of its dispersal, and the faculty of escaping inoculation of the individual variety of raspberry. This faculty and susceptibility are fixed factors in the different varieties, and are not correlated.

HANSEN (H. H.). **Control of internal rot of caprified Figs.**— *Phytopath.*, xvii, 3, pp. 199–200, 1927.

The results of experiments made in 1926 by the author indicate

that 'endosepsis' or internal rot of caprified Smyrna figs caused by *Fusarium moniliforme* var. *fici* [*R.A.M.*, v, p. 112] may be economically controlled by injection through the eye into a limited number of caprifigs (preferably of the Mammone variety) of one of the following fungicides; mercuric chloride 0·05 per cent., formaldehyde 0·2 per cent., mercurochrome 0·1 per cent., semesan 0·2 per cent., or a 5 per cent. solution of commercial lime-sulphur. The injections should be made not less than three weeks after the fig is caprified. This treatment had apparently no injurious effect either on the figs or on the caprifying insect (*Blastophaga psenes*), which emerged from the fruit free from *F. moniliforme*, while all those that emerged from the controls were contaminated. It is believed that by the removal and destruction of all untreated figs, the source of infection would be eliminated, and a clean strain of the insect established.

ASHBY (S. F.). **Bacterial wilt disease of Bananas.**—*Kew. Bull. Misc. Inform., 1927*, 1, pp. 14–18, 3 pl., 1927.

A more detailed account is given of the bacterial disease of bananas found by the author affecting the Giant Fig and Red Fig in Trinidad [*R.A.M.*, v, p. 678]. The symptoms of the diseases of tobacco and tomato caused by inoculation with pure cultures of the organism isolated from diseased bananas are fully described and a brief summary of its cultural characters is given. In both respects the results correspond with those recorded for *Bacterium solanacearum*, with which the Trinidad organism is identified. It is stated that the Chinese or Cavendish banana [*Musa cavendishii*] is apparently rarely attacked by this disease, though it was successfully inoculated by Rorer.

VOGT (E.). **Die chemischen Pflanzenschutzmittel, ihre Anwendung und Wirkung.** [Chemical preparations for plant protection, their application and effect.]—134 pp., 12 figs., Berlin and Leipzig, Sammlung Göschen No. 923, Walter de Gruyter & Co., 1926. [Received June, 1927.]

After a brief preface by O. Appel outlining the economical importance of the prevention and control of plant diseases, the present book describes in semi-popular language the principal chemical preparations [almost exclusively of German origin] used in the control of fungus diseases, insects, and animal pests of cultivated crops in Germany. The work is divided into the following chapters. (1) Seed disinfectants, both liquid and dusts. (2) Sprays and dusts for use on growing plants. (3) Soil disinfection. (4) Fumigation. (5) Chemicals for the control of rodents. (6) Sundry other preparations for the protection of plants. In each case the active fungicidal principle (when known) is indicated and descriptions are given of the effects of the preparations both on host and parasite, and of the methods and apparatus for their application. A list is also given of the most important German crop diseases and pests, as well as tables indicating the cost under present local conditions of the preparations and apparatus described.

GUYOT (L.). **Le problème actuel des anticryptogamiques. I. Le problème du cuivre.** [The present problem of fungicides. I. The problem of copper.]—*Journ. d'Agric. Prat.*, xci, 12, pp. 236–238, 1927.

It is estimated that the quantity of copper sulphate used annually by viticulturists in France and her North African colonies amounts on an average to 50,000 tons, of which 20,000 tons are imported from America. Some data on the production and price of raw copper are given. Copper sulphate now costs in France Fr. 300 per 100 kg., the high price being due partly to taxation, partly to the low exchange value of the franc, and in part to the American monopoly of copper production. At such a prohibitive cost the treatment of vineyards, &c., for the control of fungous diseases becomes an extremely heavy burden.

TONDUZ (P.). **Action de quelques produits insecticides ou fungicides sur les métaux et alliages pouvant être utilisés dans la construction des pulvérisateurs.** [The action of certain insecticides or fungicides on the metals and alloys used in the manufacture of spraying apparatus.]—*Annuaire Agric. de la Suisse*, xxviii, pp. 28–41, 1927.

The metals and alloys tested with certain insecticides and fungicides [of which a list is furnished] were red copper, tinned copper, zinc, lead, iron, aluminium, yellow brass, and 'bico', a special brass prepared by Birchmeier at Künten [*R.A.M.*, iv., p. 624]. Thin sheets of the metal were weighed and immersed for a given period in the various liquids, after which they were washed successively in ordinary water, distilled water, and spirit, dried, and weighed again. The loss of weight provided the measure of the rapidity and intensity of attack by the substance tested.

Tinned copper, brass, and bico proved to be the most resistant to the action of the more commonly employed insecticides and fungicides. Copper was rapidly and vigorously attacked by lime-sulphur and alkaline polysulphides. Such attack may be temporarily avoided by coating the inside of copper apparatus with a resinous varnish, copal varnish for instance. A linseed oil varnish is not recommended. Lead, iron, and zinc are very rapidly attacked and disintegrated by copper acetate, preparations of which should never be used in leaded copper, iron, or zinc appliances. Lead, on the other hand, protects copper against the destructive action of alkaline and alkaline-argillaceous polysulphides. Iron should never be employed in spraying receptacles, nor are zinc or galvanized iron advisable. Aluminium is very sensitive to the action of both alkaline and saline solutions. Iron, zinc, and aluminium, as well as copper, may be protected for a time by the use of resinous varnishes.

GOWDEY (C. C.). **Insecticides and fungicides.**—*Jamaica Dept. of Agric. Entomol. Circ.* 12, 11 pp., 1927.

In this circular, which refers chiefly to insecticides, the following formulae of fungicidal preparations are included. Ammonia-copper carbonate (3 pts. and 3 oz., respectively, in 50 galls.) for use instead of Bordeaux mixture on mature fruits; Bordeaux mixture, alone

and in combination with various insecticides; corrosive sublimate (2 oz. in 15 galls.) against scab of seed potatoes [*Corticium solani*]; and potassium sulphide (3 oz. in 10 galls.) against powdery mildew of roses [*Sphaerotheca pannosa*].

CATHCART (C. S.) & WILLIS (R. L.). **Analyses of materials sold as insecticides and fungicides during 1926.**—*New Jersey Agric. Exper. Stat. Bull.* 441, 16 pp., 1926. [Received May, 1927.]

This bulletin presents the results of the examination of 135 samples of insecticides and fungicides collected for inspection during 1926 [cf. *R.A.M.*, v, p. 437].

Ten brands of Bordeaux mixture were examined for their copper content, namely: (1) dry Bordeaux mixture (Ansbacher Insecticide Co., Inc., New York), containing 17·67 per cent. metallic copper. (2) Powdered Bordeaux mixture (Bowker Chemical Co., New York), 12·73 per cent. (3) Bordeaux mixture (Chipman Chemical Engineering Co., Inc., New York), 11·48 per cent. (4) Orchard Brand Bordeaux Mixture Powder (General Chemical Co., New York), 12·89 per cent. (5) Bordeaux mixture, pulp (Hammond's Paint & Slug Shot Works, Beacon, N.Y.), 4·15 per cent. (and 68·64 per cent. water). (6) Key Brand Bordeaux mixture powder (Interstate Chemical Co., Jersey City, N. J.), 14·63 per cent. (7) Green Cross Dry Bordo (Kil-Tone Co., Vineland, N. J.), 23 per cent. (8) Anchor Brand dry Bordeaux mixture (Leggett & Bro., Inc., New York City), 11·18 per cent. (9) Bordeaux mixture, powder (Mechling Bros., Chemical Co., Camden, N. J.), 17·8 per cent. (10) Dry Corona Bordeaux mixture (Pittsburgh Plate Glass Co., Milwaukee, Wisc.), 20·7 per cent.

The sulphur in the following dusting mixtures was determined: (1) 80–20 (J. R. Gillam & Bro., Burlington, N. J.), containing 74·6 per cent. total sulphur. (2) New Jersey Dry Mix (J. R. Gillam), 61·81 per cent. (3) Special Dry Mix (Kil-Tone Co.), 54·64 per cent. (4) Sulpho-tone (Lucas-Kil-Tone Co., Vineland, N. J.), 60·62 per cent. (5) 80 sulphur–20 lime (Mechling Bros.), 77·99 per cent. (6) Dry Mix (Mechling Bros.), 64·65 per cent. (7), (8), and (9) Niagara Dry Mix (Niagara Sprayer Co., Middleport, N.Y.), 64·07, 59·4, and 62·08 per cent., respectively. (10) Niagara 80–20 mixture (Niagara Sprayer Co.), 79·23 per cent. (11) Naco Brand sulphur smoke dusting mixture (Nitrate Agencies Co., Bayonne, N.J.), 79·58 per cent. (12) Agricultural sulphur compound (Toyah Valley Sulphur Co., New Orleans, La.), 21·5 per cent.

The four lime-sulphur solutions examined were as follows: (1) and (2) Lion Brand concentrated lime-sulphur solution (J. A. Blanchard Co., New York), containing 21·12 and 22·33 per cent. total sulphur in solution at 28° and 29° Beaumé, respectively. (3) Lime-sulphur (Herbert & Herbert, Inc., Perth Amboy, N.J.), 25·64 per cent. sulphur at 32·5°. (4) Anchor Brand lime-sulphur solution (Leggett & Bro.), 25·82 per cent. sulphur at 33°.

Sulfocide (B. G. Pratt Co., New York) contained 34·2 per cent. total sulphur in solution at 40° Beaumé.

The dry lime-sulphur preparations included: (1) and (2) dry lime-sulphur (Bowker Chemical Co.), containing 59 and 59·2 per cent. total sulphur, respectively. (3) Key Brand dry lime-sulphur

(Interstate Chemical Co.), 62·43 per cent. (4) Dry lime-sulphur (Leggett & Bro.), 60·79 per cent. (5) Dry lime-sulphur (Sherwin-Williams Co., Cleveland, Ohio), 60·57 per cent.

Analyses of a number of other miscellaneous fungicides are given.

Pflanzenschutzmittel des Deutschen Pflanzenschutzdienstes. Februar 1927. [Disinfection preparations of the German Plant Protection Service. February 1927.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 2, pp. 19–23, 1927.

This is a list of preparations [already enumerated elsewhere] which have been tested by the German Plant Protection Service and found efficacious in the control of fungous and insect pests of cereals, fruit, and vines [*R.A.M.*, vi, p. 277].

Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenschutzdienstes. Februar 1927. [List of disinfectant preparations of the German Plant Protection Service, 1927.]—*Deutsch. Pflanzenschutzdienst Merkbl.* 7, 4 pp., 1927.

This list supersedes the foregoing [see preceding abstract], from which it differs in the adoption of new names for certain preparations [*R.A.M.*, vi, p. 278], and in the omission of others since withdrawn from the market.

McWhorter (F. P.). **Fungicidal value of oil sprays.**—*Phytopath.*, xvii, 3, pp. 201–202, 1927.

This brief note records promising results obtained in preliminary experiments on the control of a heavy outbreak of rose mildew (*Sphaerotheca pannosa*) in the vicinity of Norfolk, Virginia, by spraying the bushes with a one in four dilution of the oil known as Volck concentrate mixture, which was applied coincidentally with the first appearance of the mildew. It is believed that the control effected was not due to protection alone, but that there was a direct fungicidal action, as the majority of the patches of mildew covered with the oil failed to develop further.

International Bulletin of Plant Protection, 1927.

In accordance with a scheme proposed by the Italian Government and adopted at the Eighth General Assembly of the International Institute of Agriculture, Rome, the Institute will from now onwards act as a centre for international phytopathological notification and documentation. The various Governments have been invited to nominate official correspondents to the Institute, chosen from among the staffs of specialized scientific institutions, for the purpose of collecting and transmitting without delay all communications relating to any fact considered worthy of special note in regard to plant diseases and pests occurring in the different countries. Non-parasitic diseases; cryptogamic diseases due to bacteria, myxomycetes, fungi, algae, and lichens; phanerogamic parasites and weeds; noxious insects and other injurious invertebrates; and noxious vertebrates are to be included.

A monthly publication, of which the first number was issued in February, 1927, incorporating this information, will be printed in

five languages (English, French, German, Italian, and Spanish) and will comprise the following subdivisions: discoveries and current events in world phytopathology; questions relating to plant protection in the different countries; legislation and administrative measures for plant protection; recent bibliography relating to plant diseases and pests; notes concerning congresses, exhibitions, competitions, institutes, and societies.

THAYSEN (A. C.) & BUNKER (H. J.). **The microbiology of cellulose, hemicelluloses, pectin and gums.**—vi + 363 pp., 21 figs. Oxford University Press, London, 1927.

In this book the authors give a comprehensive survey of the present state of knowledge concerning the part played by micro-organisms in the decomposition and putrefaction of cellulose, hemicelluloses, pectin, and gums. The organisms are divided into three groups: Schizomycetes, Actinomycetes, and Eumycetes. The first are subdivided not by families, but on the basis of their biological reactions, i. e., the temperatures at which they grow and their relations to oxygen. The naming and description of the morphology of the Actinomycetes are based on Ørskov's recent investigations of this group (*Investigations into the morphology of the Ray Fungi*, Levin and Munksgaard, Copenhagen, 1923). The Eumycetes are divided into two groups: those that decompose pectin and hemicelluloses, and those that decompose cellulose and lignin. They are listed by classes, orders, and families, and their descriptions have been for the most part taken from Rabenhorst's *Kryptogamenflora*. In dealing with the genera *Aspergillus*, *Penicillium*, and *Fusarium* the authors point out that in the past these organisms have often been referred to in the literature without sufficient details being given of the species studied, thus rendering their identification difficult.

The remaining chapters discuss in detail the microbiological decomposition processes of the substances studied, and some industrial applications of these processes, such as retting, ensilage, the fermentation of tobacco, starch production by fermentation, and the like. A special chapter is devoted to wood and wood-pulp-destroying fungi, which are listed in a table, copied from Hubert [*R.A.M.*, iv, p. 385], showing their diagnostic characters. Literature references are given at the end of each chapter, and the book is very fully indexed under the authors quoted and subjects.

LEIGHTY (C. E.). **Breeding plants for disease resistance.**—*Journ. Amer. Soc. Agron.*, xix, 3, pp. 219–225, 1927.

Some of the most important recent work in connexion with plant breeding for disease resistance is briefly summarized. The writer considers that the data presented by Aamodt in his paper on the selection of wheat for resistance to stem rust (*Puccinia graminis*) [see above, p. 471] are comparable in many respects to those obtained by himself and his collaborators in their studies on leaf rust (*P. triticina*) [*R.A.M.*, v, p. 725]. Most of the references in the present paper have already been noticed in this *Review*.

ZIMMERMANN (A.). **Sammelreferate über die Beziehungen zwischen Parasit und Wirtspflanze. Nr. 3. Sclerotinia, Monilia und Botrytis.** [General review of the relations between parasite and host. No. 3. *Sclerotinia, Monilia,* and *Botrytis.*]—*Centralbl. für Bakt.*, Ab. 2, lxix, 15–24, pp. 352–425; lxx, 1–7, pp. 51–86; 8–14, pp. 261–313; 15–24, pp. 411–436, 22 figs., 1927.

This exhaustive survey of the relations between parasite and host in the genera *Sclerotinia, Monilia,* and *Botrytis* has been prepared on the same lines as the author's previous papers on other groups [*R.A.M.*, v, p. 120]. Numerous citations from contemporary literature are given, and a bibliography of 17 pages is appended.

SMITH (J. H.). **Recent work on virus diseases in plants.**—*Proc. Roy. Soc. Med.*, xx, pp. 11–18, 1927.

Some of the more important recent developments in connexion with virus diseases of plants are presented and discussed with reference to current literature. Nearly all the papers cited in the bibliography have already been noticed in this *Review.*

JOHNSON (J.). **The classification of plant viruses.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 76, 15 pp., 8 pl., 1927.

In this paper the writer presents a tentative system of classification of certain plant viruses occurring in tobacco and other solanaceous hosts or capable of being transmitted to these, based on their reaction to various factors applicable as tests, e. g., symptomatology on differential hosts, longevity *in vitro*, the thermal death-points, and the lethal action of chemicals [cf. *R.A.M.*, vi, p. 243]. Eleven types are distinguished, viz., tobacco mosaic, cucumber mosaic, speckled tobacco mosaic, mild tobacco mosaic, spot necrosis of tobacco, ring spot of tobacco, yellow tobacco mosaic, medium tobacco mosaic, bleaching mosaic, and tomato stem necrosis.

The coexistence of two or more viruses in a single plant is not uncommon, and in the above-mentioned cases the separation of such combinations is frequently possible. For instance, the separation of a combination of the ordinary tobacco mosaic virus and the cucumber mosaic virus was accomplished by inoculating pokeweed [*Phytolacca decandra*] with the mixed viruses. This host being susceptible to cucumber mosaic but not to that of tobacco, the former was secured free from admixture. Another portion of the combined extract was aged for four days and then inoculated into tobacco. Since ageing for three days or more destroys the cucumber mosaic virus, the inoculation of tobacco with the combination resulted in ordinary tobacco mosaic alone.

It is sometimes possible to separate a combination of three viruses. For example, in a combination of speckled tobacco mosaic, cucumber mosaic, and mild tobacco mosaic, isolation may be effected by heating a portion of the extract to about 75° C. for ten minutes to destroy the infectivity of the two latter viruses. Another portion of the extract may be aged for three days to destroy the cucumber virus, followed by the inoculation of *Nicotiana glutinosa*, which will become infected with the mild mosaic but not with the speckled

tobacco virus. Finally, a third untreated portion should produce cucumber mosaic alone on inoculated pokeweed.

During the author's investigations it was found possible to produce artificial infection on the potato with all the above-mentioned viruses except ring spot. It is unlikely that these viruses are responsible for any potato diseases in nature, but the difficulty of transmitting them from the potato to other Solanaceae renders this point uncertain.

Some of the virus diseases are so closely related that their separation seems hardly justifiable. Known attenuated viruses should retain a designation indicative of their origin. Medium tobacco mosaic may be regarded as an attenuated form of tobacco mosaic, but in the absence of proof the author thinks it should be placed in a separate class. Yellow tobacco mosaic resembles medium tobacco mosaic in virulence, while the additional yellow character on which its classification is based may or may not depend on the existence of another virus. The writer is inclined to believe that yellow mosaic is a distinct pathological condition induced by special factors as yet undetermined. Generally speaking, although the virulence of some plant viruses may be attenuated or increased, experimental evidence indicates that they are relatively stable and specific entities.

FOLSOM (D.). **Uniformity of nomenclature for the viruses of Solanum tuberosum.**—*Phytopath.*, xvii, 3, pp. 161–165, 1927.

After a cursory review of the reasons and methods advanced in literature for the standardization of the descriptive names of the so-called virus diseases of the potato, the author suggests the convocation of a committee with sufficient authority and knowledge to select designations which will then be regarded as standard. He further suggests that this committee might consider the virus diseases of all species of plants instead of those of the potato alone, and that each disease should be designated by Arabic numerals either in a separate series for each species of host plant, or in a single series for all the species together.

KÖHLER (E.). **Fortgeführte Untersuchungen über den Kartoffelkrebs. II.** [Continued investigations on wart disease of Potatoes. II.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xv, 2, pp. 135–176, 3 pl., 29 figs., 1927.

The writer has continued his studies on *Synchytrium endobioticum* in regard to the results of infection of potato tissues by it, with special reference to the factors governing varietal reaction to its attacks [see also *R.A.M.*, v, p. 578].

Four types of reaction of the host tissue to infection are distinguished. In the gall reaction, which occurs in young tissues, radial galls develop on the aerial organs (leaves and stems) of the plant from meristems originating near the point of infection. These neoplasms are characterized by the development, near the point of infection, of a circular swelling, from which leafy organs arise. Frequently the inception of a second circle of leaves within the outer circle can be traced. The basal portion of the gall is often elongated to a stalk in which the tissues are similarly distributed

to those of a young potato stem. Immense circular proliferations, showing a relatively slight degree of differentiation, are formed on underground rudimentary leaves of the young leaf-shoots infected by wart disease. The entire structure of these leaves is altered by the development of excrescences, which increase irregularly in size, the ultimate stage being a coralloid, fleshy growth termed a leaf proliferation. When all the leaves of a bud are infected, the longitudinal growth of the shoot axis is arrested in such a way that all the distorted leaves arising from the stunted axis combine to form a uniform segmented body (shoot proliferation).

In the so-called abortive reaction the sori fail to reach maturity (subinfection) as the result of decay in the adjacent tissues of the host, which cuts off the supply of nutrient substances. The host tissues exhibit the salient features of wound reaction (cork formation, the development of wound gum, and the like), the analogies between which and the abortive reaction justify the assumption that the stimuli inducing the latter originate in the host cell, and are thence diffused into the surrounding tissues.

The maturation of the sorus with the liberation of the summer sporangia from it leads directly to the death of the host cell, and sets free substances from the killed cell which stimulate the adjacent tissues to a process of growth and division resulting in the setting free of the mature summer sporangia from the tissues of the host: this process is designated as the evacuation reaction. The characters of a wound reaction are also present in this process, which is distinguished, however, from the abortive by the absence of gummosis. The evacuation process is entirely distinct from the gall reaction, as shown by its typical occurrence in older tissues which are no longer capable of the latter.

The three types discussed above are occasioned exclusively by summer sori. The fourth type, termed the division reaction, occurs in the epidermis of young shoots or leaves as a result of infection from resting sporangia, and causes the development of peculiar epidermal swellings resulting from cell division in the epidermis.

Inoculation experiments [the results of which are presented in tabular form] were carried out on potato varieties known to be of varying degrees of resistance and susceptibility. Deodara, Industrie, Rubia, and Goldball are all grouped as susceptible to wart disease, though the two last-named are ordinarily placed in the 'almost immune' class. Preussen, Kuckuck, Beseler, Blochinger, and Görsdorfer Niere belong to the so-called 'completely immune' class. The differences in the degree of susceptibility from variety to variety are in reality gradual, and chiefly depend on the degree of intensity of the gall reaction as shown by the development of proliferations. Below a certain degree of intensity the varieties are incapable of developing proliferations, and all these are grouped as resistant. Differences in the frequency of infection are apparently of subsidiary importance within the group of susceptible varieties. In resistant varieties the incidence of infection is uniformly much reduced.

In most resistant varieties a high percentage of all infections are certainly abortive. Among the susceptible varieties subinfections are generally rare, occurring on the aerial leaves, but being entirely

absent from the aerial shoot axes and subterranean organs. In the case of Preussen, subinfections were found on young subterranean leaves as well as on the mature aerial foliage, and also developing from secondary infections in the interior of radial galls.

The following factors, therefore, should be considered in grading for varietal resistance or susceptibility: (1) the number of full infections; (2) the number of subinfections; and (3) the intensity of the gall reaction.

FISCHER (W.). **Die Notwendigkeit der Schaffung eines Zwischenstaatlichen Kartoffelkrebsabkommens.** [The necessity for the establishment of an international agreement concerning wart disease of Potatoes.]—*Deutsche Landw. Presse*, liv, 10, pp. 131–132, 1927.

After briefly recapitulating the regulations against wart disease of potatoes [*Synchytrium endobioticum*] in force in various countries, the writer outlines a scheme for the establishment of an international agreement on the lines of the international vine *Phylloxera* convention, with a view to securing uniformity of procedure and economy of administration in the measures taken to prevent the inter-State dissemination of this disease.

SANDSTEN (E. P.). **Potato growing in Colorado.**—*Colorado Agric. Exper. Stat. Bull.* 314, 30 pp., 4 figs., 1927.

The section of this bulletin dealing with potato diseases (pp. 23–30) contains local and general information on mosaic, leaf roll, curly dwarf, spindle tuber, scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium solani*], *Fusarium* diseases, and blackleg [*Bacillus atrosepticus*]. The writer believes that the so-called degeneration diseases are partially dependent on poor seed and unfavourable climatic conditions. The season of 1925 was remarkable for the absence of these diseases in Colorado, while in 1924 mild forms, especially of mosaic, were widely prevalent. Scab is highly destructive in the State, especially on white-skinned varieties. The most serious damage from *Fusarium* diseases occurs in the plains during the period of heavy irrigation in August. Blackleg is very severe in the early part of the season on over-irrigated or poorly drained land. Directions for seed treatment with hot and cold corrosive sublimate and formaldehyde are given.

LEACH (J. G.). **The nature of seed-piece transmission of Potato blackleg.**—*Phytopath.*, xvii, 3, pp. 155–160, 4 figs., 1927.

A brief account is given of experiments carried out in 1925 at the Minnesota Agricultural Experiment Station to test the nature of the transmission of potato blackleg [*Bacillus atrosepticus*] by seed-pieces, in which naturally and artificially infected tubers were cut in half, planted in pots, and grown in the greenhouse. The results lead the author to the conclusion that the disease may be systemic in nature, and may be perpetuated by tubers naturally infected through the vascular bundles which enter the tuber from decaying stolons. Artificial inoculation through the parenchyma tissues appeared to be relatively ineffective in producing the disease,

unless aided by some agency which inhibits cork formation [see also *R.A.M.*, v, p. 573].

MARTIN (W. H.). **Potato scab control studies in 1924.**—*Forty-sixth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1925*, pp. 460–464, 1926. [Received May, 1927.]

Approximately equal control of potato scab [*Actinomyces scabies*] was given by the application of inoculated or uninoculated sulphur at the rate of 600 lb. per acre. The Green Mountain was found to be the most susceptible variety, and Rural Russet and the Rose group the most resistant. In one test a considerable increase in the number of clean tubers resulted from the application of 350 lb. sulphur per acre.

SZYMANEK (J.). **Quelques observations sur la morphologie du mycélium et des suçoirs du Phytophthora infestans dans le tubercule de Pomme de terre.** [Some observations on the morphology of the mycelium and haustoria of *Phytophthora infestans* in the Potato tuber.]—*Comptes rendus Acad. des Sciences*, clxxxiv, 10, pp. 620–622, 5 figs., 1927.

These observations, which seek to throw fresh light on the development of *Phytophthora infestans* in potato tubers, showed that the intercellular hyphae were wide, branched, and palmate, and covered nearly half the cells with which they were in contact. The haustoria vary greatly in form; they may be club-shaped (single or double), hooked, or even spirally twisted, and are sometimes provided with appendages resembling those found in the leaf tissues. Most of them are swollen at the distal end, and they are furnished with very thick walls and a narrow lumen. The base of the haustorium measures as much as its length. Since the haustoria vary widely in diameter and the membranes of the invaded cells display perforations very little smaller in diameter than the smallest haustoria, penetration probably occurs through these perforations.

MACMILLAN (H. G.) & CHRISTENSEN (A.). **A study of Potato seed treatment for Rhizoctonia control.**—*Wyoming Agric. Exper. Stat. Bull.* 152, pp. 57–67, 1 fig., 1927.

The *Rhizoctonia* disease of potatoes (*R.* [*Corticium*] *solani*) is the most common potato trouble of fungous origin in Wyoming, where this crop is not extensively grown (14,000 acres in 1925 compared with 22,000 acres in 1922). The symptoms of the disease are briefly described, and an account is given of a series of experiments, carried out from 1921 to 1925, to ascertain the value of seed treatment in its control. The results of the tests [which are presented in tabular form] indicate that one hour's immersion in mercuric chloride (1 in 1,000) is equally beneficial both for early and late maturing varieties, represented by Bliss Triumph and King, respectively [cf. *R.A.M.*, vi, p. 181]. The average total increase in yield for the period under review amounted to 17·5 and 17·3 per cent. for the two varieties. The treatment may be recommended, on the basis of these data, as likely to prove commercially

valuable. The severity of the disease was not consistently affected by early or late irrigation.

MARTIN (W. H.). **Potato spraying in 1924.** *Forty-sixth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1925*, pp. 464–467, 1926. [Received May, 1927.]

Good results in the control of tipburn, hopperburn, and early blight of potatoes [*Alternaria solani*] were given by the application of 5–5–50 Bordeaux mixture. In one test the increased yield in the sprayed plots amounted to 50·4 bushels per acre. In an experiment with late planted Irish Cobblers, two applications of 10–10–50 Bordeaux mixture resulted in a higher yield than four of 5–5–50 [cf. *R.A.M.*, v, p. 382].

BONDE (R.). **Variation of strains of Alternaria solani isolated from lesions on Potato tubers.**—Abs. in *Phytopath.*, xvii, 1, p. 56, 1927.

Cultures isolated from early blight lesions (*Alternaria solani*) on potato tubers were found to include different strains of the causal fungus, which differed from each other by the pigmentation they produced on potato agar, their rate of growth, the macroscopic appearance of the mycelium, production of conidia, and their relative pathogenicity on potato leaves and tubers. Saltations occurred rather frequently in some strains, giving rise to new forms distinctly different from the parent strain. Some details are given of the effect on pigmentation of temperature, hydrogen-ion concentration of the medium, and sunlight. The pigment produced by chromogenic strains is deep red or carmine on alkaline and yellow on acid substrata. The chromogenic character of the strains in culture is not correlated with their pathogenicity.

POOLE (R. F.). **Sweet Potato disease investigations.**—*Forty-sixth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1925*, pp. 484–507, 2 pl., 1926. [Received May, 1927.]

A soft rot disease of sweet potatoes known as 'mottle necrosis' [*R.A.M.*, iv, p. 440] has caused severe losses in New Jersey (up to 50 per cent. in the Vineland district) during the last two years. Inoculation experiments are in progress with the fungi and bacteria isolated from diseased material.

A storage disease which causes a pickling effect has been reported from Swedesboro. The tuber turns brown and softens, the inner tissues becoming watery and greyish or yellowish, while liquid is freely exuded from the cells. Tests indicate that alcohol is formed. A species of *Saccharomyces*, together with bacteria, was constantly isolated from infected potatoes, but so far the inoculation experiments have given negative results.

Stem rot (*Fusarium* spp.) [*F. batatatis* and *F. hyperoxysporum*: ibid., v, p. 579] was more prevalent under warm and dry conditions than in a moist, cool atmosphere. The Red Brazil, White Yam, and Triumph varieties have shown resistance to stem rot for three years. The results of a test to ascertain the effect of planting at different distances indicate that the best yields are obtained

when the plants are set 12 to 18 inches apart (between 9,680 and 14,520 plants per acre).

Laboratory studies on scurf or soil stain (*Monilochaetes infuscans*) indicate that infection is most prevalent at a reaction near the neutral point. Good results in the control of this disease were again obtained by the application of sulphur at the rate of 300 and 600 lb. per acre [ibid., v, p. 383]. It was shown that the incidence of infection was much higher in potatoes harvested on and after 1st September than in those lifted on 15th July or 1st August.

Pox of sweet potatoes [*Cystospora batata* or *Actinomyces*: ibid., v, p. 383] was well controlled by the application of sulphur at the rate of 300 lb. per acre. The application of lime again caused an increase of infection.

SHARPLES (A.). **Further work on treatment of 'wet-root rot'.**—*Malayan Agric. Journ.*, xv, 2, pp. 35–40, 1927.

This paper is a continuation of the author's previous report [*R.A.M.*, v, p. 449] on the wet root rot (*Fomes pseudoferreus*) of *Hevea brasiliensis* in Malaya, and reproduces much of the information contained in the latter. As further experience was gained in the control work on the lines previously described, much better results were obtained both in the number of trees treated and in reducing the cost of the treatment. Thus, in the period from April to October, 1926, the total number of trees examined was 1,400, out of which 414 were treated by the severance of the lateral roots, and 371 were destroyed, the cost of the treatment (carried out with Tamil labour) being reduced during October to $0·65 per tree [$1 = approx. 2*s.* 4*d.*]. The task of detecting diseased trees was also facilitated by the observation that trees with diseased roots usually have one or two of the lower branches dead, their foliage appears unhealthy and the leaves are small. The lateral roots of such trees should be examined, and if the bark of the roots shows a slight reddish discoloration, the soil should be removed to find if the under side is diseased. If no evidence of the disease is visible there, the root will probably be found to be infected further from the tree. In one case the diseased lateral was traced as far as 45 feet from the stem, and infected five other trees, with the roots of which it came in contact. Full confirmation was obtained of the occurrence of the disease in cycles. The first attack may be expected to occur some time after the tenth year from planting; if no control measures are then taken, the second outbreak will appear about the fifteenth year, finally resulting in such a reduction of good-yielding old trees as to render the plantation economically unprofitable.

WAKSMAN (S. A.). **Principles of soil microbiology.**—xxviii + 897 pp., 19 pl., 67 graphs, 10 diags., 4 charts, Baillière, Tindall & Cox, London, 1927.

This book is one of the most complete studies hitherto published on a branch of soil science which is steadily increasing in importance. Chapter I deals with the different groups of micro-organisms occurring in the soil, and in subsequent chapters bacteria and their effects, soil algae, fungi (including mycorrhiza), actinomycetes,

and protozoa and other animals are fully discussed. More than half the book is devoted to the chemical activities of soil micro-organisms, such aspects as the soil as a medium for their growth and the influence of environmental conditions on their activities being treated in detail. The sections on soil fungi and their effects are of great value in giving a clear view of the conclusions arrived at by the author and other workers as to the rôle played by these plants in the decomposition of organic matter in the soil. A classified list of reference books of nine pages forms a useful feature of the work, in addition to the copious bibliography provided in foot-notes.

KELLY (N. L.). **Investigations into diseases of Cane.**—*Twenty-sixth Ann. Rept. Queensland Bureau of Sugar Exper. Stat.*, pp. 26–29, 1926. [Received June, 1927.]

The writer summarizes the results of his investigations from March to December, 1926, on the following sugar-cane diseases in Queensland: Fiji disease [*Northiella sacchari*], to guard against which the importation of canes from New South Wales has recently been restricted; gumming disease (*Bacterium vascularum*), which is serious and widespread, though the incidence of infection has been considerably reduced during the last two years; leaf scald (*Bacterium* sp.), which is stated to have reached epidemic proportions at Innisfail and Babinda; and mosaic, which is more prevalent and causes a larger amount of secondary infection in the south of Queensland than in the northern districts. Brief notes are also given on leaf stripe (*Sclerospora sacchari*), red rot (*Colletotrichum falcatum*), foot rot (a fungous disease of the roots), and iliau [*Gnomonia iliau*]. More detailed observations on all these diseases have already been noticed [*R.A.M.*, vi, p. 375 *et passim*].

FARIS (J. A.) & ALLISON (R. V.). **Sugar cane root disease in Cuba. A progress report upon the root disease situation in 1925.**—*Phytopath.*, xvii, 2, pp. 61–82, 11 figs., 1927.

An investigation has been undertaken by the authors into the causes of the dying out of sugar-cane stools, attributed to root disease or root rot, which is not uncommon in many of the fields in Cuba. The symptoms characteristic of the trouble are the drying and rolling up of the outer leaves, followed by the rolling of the inner leaves and the death of the stalks; the root system is poorly developed, and the bases of the stalks are usually infected by various fungi, among which *Melanconium* [*Gnomonia*] *iliau* and *M. sacchari* are of frequent occurrence, working up through several internodes which show an advanced zone of blackened bundles. Pure cultures of these two species of *Melanconium* and fragments of decaying rootstocks were used for inoculating seed-pieces planted in pots of sterilized and unsterilized soils, but in no instance did the plants become infected during a growing period of 9 months. It is concluded that the fungi are semi-parasitic, and only able to infect cane stools debilitated by environmental conditions unfavourable to healthy growth. Field studies indicated that the conditions most frequently predisposing sugar-cane to root disease in Cuba were lack of aeration in undrained soils; high salt

content of the soil, associated with drought and cracking of the soil; high cutting and surface application of fertilizers; infertility of the soil; and attacks on the roots by insects and other small animals. Improved agricultural practices are indicated as the most important means of relief.

FARIS (J. A.). **Zonate foot rot of Sugar Cane.**—*Phytopath.*, xvii, 2, pp. 83–94, 10 figs., 1927.

In 1924 and 1925 an apparently new foot rot of sugar-cane was observed in Cuba. The dying plants, which were found on two very different types of soil, occurred in isolated areas surrounded by vigorously growing cane. The bases of infected stalks are characterized by distinct blackish-brown, curved rings on the rind. These zones are most conspicuous above each node and are specially noticeable after the removal of the waxy coat of the stalk. They are a continuation of characteristic concentric zones in the pith of the stem. A longitudinal section through the base of the stalk shows well-marked alternating regions of grey and reddish tissue, the latter generally being the narrower, below or immediately above soil level. The ring bordering on the healthy tissues of the stem is of a deep blood-red colour. It is separated from the ring below by a somewhat wider greyish zone, which in turn is followed by a brownish-red zone. These zones fade to a brown or buff colour in dead tissues.

Infection has been traced from the main primary stalk, through the point of attachment, into the secondary buds; from these it spreads through the point of attachment into the tertiary buds and into the shoots of the fourth rank. In every case the destruction was complete, involving the entire stool.

Both root rot (associated in Cuba with *Melanconium sacchari*, *M.* [*Gnomonia*] *iliau*, and other undetermined, semi-parasitic fungi) [see last abstract] and zonate foot rot usually appear in localized spots in the fields, but the former is largely confined to poorly cultivated areas while the latter attacks healthy canes growing under suitable conditions. In the case of plants affected by root rot, cylinders of infected bundle fibres extend through several internodes of the stalks. The diseased plants are stunted, without marked zones at the base, and begin to wilt long before they die. The rot is not dry or woody, as in the case of zonate foot rot. The 'stengelbrand' or stalk burning, occurring in Java, somewhat resembles zonate foot rot, from which it differs, however, in the absence of zonate markings and the presence of brown leaf spots.

Fruiting bodies of a hitherto undetermined species of *Fomes*, apparently belonging to the group represented by *F. pachyphloeus* and *F. melanodermus*, were found associated with the zonate areas in a manner strongly suggestive of their implication in the etiology of the disease.

LEONIAN (L. H.). **The effect of different hosts upon species of Phytophthora.**—Abs. in *Phytopath.*, xvii, 1, p. 56, 1927.

Experiments in which a number of species of *Phytophthora* were

each inoculated on green tomatoes, green chillies, eggplants, and potatoes, resulted in ready infection and subsequent abundant fruiting of the organisms. In each species the sporangia produced on different hosts showed striking differences in size and shape, such as to disconcert the most conservative morphologists. From these results the author concludes that a purely morphological system of classification of these fungi is of no great value, and that only the more constant morphological characters should be combined with reliable physiological reactions if a more satisfactory scheme of classification is to be attained [see also *R.A.M.*, v, p. 4].

DRECHSLER (C.). **Pythium ultimum and Pythium debaryanum.**—Abs. in *Phytopath.*, xvii, 1, pp. 54–55, 1927.

The author states that the species of *Pythium* most frequently concerned in the United States in damping-off, stem rot, root rot, and rootlet injury, and also in the watery rot of cabbage heads previously described by him [*R.A.M.*, v, p. 72], is evidently identical with the forms discussed morphologically under the name *P. de Baryanum* by De Bary, Ward, and in part by Miyake. It was never observed to exhibit the condition figured by Hesse, namely, a longish antheridial branch arising from the hypha bearing the oogonium at a considerable distance from the latter, and agrees morphologically with the form described by Trow as a saprophyte (presumably on insufficient evidence) under the name *P. ultimum*, by which binomial it should therefore be known.

A form approximating in its relation between oogonium and antheridium to the condition represented in Hesse's figures is also frequently concerned in the United States in damping-off, root rot, and rootlet decay. It differs from the former by a thinner oospore wall, a larger 'reserve globule', and by a moderate production of zoospores, which have never been observed in *P. ultimum*. The author considers that the name *P. de Baryanum* can be more correctly applied to this form.

WESTERDIJK (JOHANNA). **Die Frage der Botrytis cinerea und ihrer Verwandten.** [The question of *Botrytis cinerea* and its relatives.]—*Meded. Phytopath. Lab.* '*Willie Commelin Scholten*', *Baarn* (*Holland*), x, pp. 35–36, 1927.

Attention is drawn to the existence of various species of *Botrytis* closely related to *B. cinerea*, but differing from the latter in morphological and cultural characters. Among these may be mentioned *B. parasitica* on tulips, *B. narcissicola* on narcissus, and *B. galanthina* on snowdrops [*Galanthus nivalis*]. The so-called 'fire' of tulips in Holland is believed to be due to *B. parasitica* [see above p. 463] while *B. cinerea* causes a similar condition in narcissus [*R.A.M.*, v, p. 740], and another species of *Botrytis* is responsible for the same phenomenon in hyacinths. Peonies in Holland are also attacked by *B. cinerea*, but the occurrence of *B. paeoniae* [ibid., iv, p. 44] in the country is uncertain. Physiological studies on a number of forms of *B. cinerea*, mostly isolated from diseased seeds, are in progress in the writer's laboratory.

BOUWENS (HENRIETTE). **Weitere Untersuchungen über Erysipheen.** [Further investigations on the Erysiphaceae.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten', Baarn (Holland)*, x, pp. 3–31, 1927.

The writer has made further biometrical investigations on the differentiation of various species of Erysiphaceae by their conidial measurements [*R.A.M.*, iv, p. 315].

The results of the determinations [which are presented in tabular form and discussed] again showed that the conidial dimensions, especially the breadth, are very constant, fluctuating only by a few microns within each different species. Three forms of *Erysiphe cichoracearum* were distinguished on *Leontodon autumnalis*, *Lappa minor*, and *Scorzonera hispanica*, the peak of the curve for conidial measurements on the three hosts being 28 by 18, 34 to 40 by 24, and 36 to 40 by 20 to 22 μ, respectively. Cross-inoculation tests with the different biologic forms gave negative results.

The bulk of the conidia of *E. asterum* were 32 by 16 and 36 by 18 μ. Cross-inoculation tests on *Scorzonera* and *Cucurbita pepo* were unsuccessful.

The figures for the length of the conidia of *E. polygoni* ranged from 29·19 to 42·68 μ and those for breadth from 15·10 to 19·88 μ. Four biologic forms are distinguished on *Delphinium hybride*, *Hypericum perforatum*, *Lathyrus odoratus* and *Pisum sativum*, and *Brassica rapa* [*B. campestris*]. Cross-inoculation experiments gave negative results, except between peas and sweet peas.

The fluctuations in the conidial dimensions of *E. galeopsidis* on *Lamium amplexicaule* and *Galeopsis tetrahit* were very slight.

The variations in the conidial length of *E. graminis* on barley and other Gramineae were not significant, and the breadth scarcely deviated from 14 μ. No influence on the size of the conidia was exercised by the various mineral solutions in which the barley plants were grown.

The average conidial dimensions of *Microsphaera alphitoides* [*M. quercina*] range from 27·58 by 19·31 μ on beech (*Fagus sylvatica*) to 36·81 by 20·3 μ on oak (*Quercus pedunculata*). The breadth of the conidia was least (18·46 μ) on *Q. rubra* and greatest (21·83 μ) on *Q. pedunculata*. Cross-inoculation experiments between oak and beech gave positive results, thereby confirming the identity of the two forms [cf. ibid., iii, p. 616].

The perithecial stage of apple mildew (*Podosphaera leucotricha*) has not been found by the author in Holland. The conidia are characterized by fibrosin bodies. Their average length was determined as 24·49 to 28·71 μ and their mean breadth as 13·86 to 17·44 μ, the curve peaks being 26 and 16 μ for length and breadth. The average figures for *P. oxyacanthae* on *Crataegus oxyacantha* were 25·48 to 27·50 μ long and 12·14 to 14·66 μ broad and the peaks 26 and 14 μ. Inoculation experiments with *P. oxyacanthae* gave uniformly positive results on *C. oxyacantha*, whereas it was seldom possible to infect apple leaves with *P. leucotricha*, only the very young buds being susceptible. No constant difference in the size of the conidia of *P. leucotricha* and *P. oxyacanthae* was found.

The conidia of *Sphaerotheca mors-uvae* measured approximately

the same on gooseberries and white currants. Inoculation experiments on red and black currants were unsuccessful.

Small but constant variations were observed in the conidial dimensions of *S. humuli* and *S. humuli* var. *fuliginea* on different hosts. The conidia on *Taraxacum officinale* were conspicuously small (26 to 28 by 16 μ) and those on strawberry unusually broad (up to 24 μ). The conidia of the mildew occurring on *Scabiosa caucasica* possessed no fibrosin bodies and were larger than the average for *S. humuli*. This species is therefore referred to *E. polygoni*. The mildew on *Viola* sp. also differs from *S. humuli* in the absence of fibrosin bodies. Cross-inoculation tests gave uniformly negative results, except in one doubtful case between *Taraxacum* and *Doronicum clusii*.

The breadth of the conidia of *Uncinula aceris* on *Acer platanoides* was 14 μ, compared with 18 μ for those of *U. necator* on the vine. Fibrosin bodies were found in the first-named species only.

A species of mildew referred by the writer to *E. polygoni* was found on *Hydrangea hortensis* [cf. above, p. 462]. Infection on this host has also been reported by Jørstad in his survey of Norwegian Erysiphaceae [*R.A.M.*, v, p. 330].

Düngemittel- und Pflanzenschutzmittelkontrolle in Jugoslavien. [The control of fertilizers and plant protectives in Jugo-Slavia.]—*Chem. Industrie*, l, 6, pp. 186–187, 1927.

By a recent decree, a permit from the Ministry of Agriculture is required for the import of and trade in plant protectives and seed disinfectants in Jugo-Slavia, except in the case of certain specified substances. Special conditions apply to the import of patent preparations.

Brazil: legislative and administrative measures.—*Internat. Bull. of Plant Protection*, i, 1, p. 11, 1927.

A Decree, effective from 10th September, 1926 (No. 17,437), contains modifications in the original regulations of 21st December, 1921 (No. 15,189), in regard to the importation of living plants or parts of the same into Brazil. Consular visas will be granted for invoices of living plants only on presentation of official health certificates in the country of origin containing full information as to the date of inspection; name of the grower or exporter; country, district, and place of production; quality and quantity of the products inspected; and a declaration certifying that the products in question are free from dangerous diseases, insects, and other parasites considered to be harmful to crops. This certificate must be produced to an Inspector of the Department of Plant Health Control in Brazil, who must also be advised as to the destination of the products to be imported. Details of the Decree are published in *Boll. Min. Agric., Ind., e Comm.*, ii, pp. 293–4, 1926.

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SPEGAZZINI (C.). **Contribución al conocimiento de la flora micológica de las sierras de Córdoba.** [Contribution to the knowledge of the fungus flora of the mountains of Cordoba.]—*Bol. Acad. Nac. Cien. Argentina, Córdoba*, xxix, pp. 113–190, 16 figs., 1926. [Received June, 1927.]

An annotated list is given of 184 species of fungi and 15 Myxomycetes collected by C. Bruch in 1925 in the mountain range of Cordoba, Argentine Republic. The fungi include a certain number of parasitic forms, chiefly rusts and Deuteromycetes, of which *Uromyces poinsettiae* on *Poinsettia* [*Euphorbia*] *heterophylla*, *Uredo acalyphae* on *Acalypha cordobensis*, *Septoria zinniae* on *Zinnia pauciflora*, *Septogloeum molfinoi* on *Croton lorentzii*, and *Cercospora verbeniphila* on *Verbena bonariensis* are amongst the new species described.

MURRAY (B. JEAN). **Four fungi on the endemic species of Rubus in New Zealand.**—*Trans. New Zealand Inst.*, lvii, pp. 218–225, 2 pl., 13 figs., 1926. [Received June, 1927.]

The four fungi found by the author on living plants of endemic species of *Rubus* in the south island of New Zealand were *Erysiphe carpophila* var. *rubicola* on *R. australis*; *Phyllosticta variabilis* on *R. cissoides* and *R. australis*; and *Pestalozzia antennaeformis* n. sp., sometimes in conjunction with *Coryneum ruborum*, on the two above-mentioned species of *Rubus*.

P. antennaeformis resembles *P. longiseta*, from which it differs in its larger spores, shorter pedicels, and the regular, clubbed, and shorter cilia. *E. carpophila* var. *rubicola* differs from the type in its somewhat larger perithecia with longer appendages, as well as in its occurrence on the leaves in addition to the carpels.

COLEMAN (L. C.). **Structure of spore wall in Ganoderma.**—*Bot. Gaz.*, lxxxiii, 1, pp. 48–60, 1927.

From a cytological and microchemical study of the structure of the spore wall of *Ganoderma applanatum*, *G. tsugae*, and of three other species of the genus, the author concludes that the thin-walled epispore in these forms is probably comparable with the undifferentiated spore wall of *Fomes fomentarius*. It consists of a hemi-cellulose with possibly the addition of a gum which serves to attach the spore to the surface on which it falls. The endospore is laid down on the inner margin of the epispore as a series of granules, which later fuse to form a membrane. This thickens and develops on its outer surface spiny processes, which project into the epispore at a time when the latter is still plastic. The distal end of the epispore is prolonged into a hyaline beak, the collapse of which in dried material has led systematists to describe the spores as 'truncate at the base'. In the species *G. tornatum* and *G. lionettii* the beak is not supported by any projections of the endospore, and breaks off instead of collapsing. At the proximal end of the endospore is a small pore, somewhat asymmetrically placed, around which the endospore projects outward towards the surface of the epispore. This marks the point of attachment to the sterigma. The endospore is said to be composed of chitin and other compounds at present unknown.

In conclusion, the author states his opinion that the structure of the spore wall is a character of much greater systematic importance than many of those used at present, and all forms showing the spore characters described above should be brought together under the genus *Ganoderma*.

STEINMANN (A.). **Het een en ander omtrent wortel-schimmels.** [Notes on root fungi.]—*De Thee*, vii, 3, pp. 87–91, 5 pl., 1926. [Received May, 1927.]

After some general observations on the nature of root fungi, the writer gives particulars of the morphological characters of three closely related organisms commonly occurring on economic plants in the Dutch East Indies, namely, *Ganoderma pseudoferreum*, *G. applanatum*, and *G. lucidum*.

The red root fungus, *G. pseudoferreum* [*R.A.M.*, v, p. 54], causes severe damage to tea, cacao, coffee, rubber, and a number of green manure plants, e.g., *Tephrosia*, *Crotalaria*, and *Albizzia*. The snow-white (later dark brown to black), zonate fructifications develop at the base of the tree, subsequently growing out from the trunk in the shape of brackets.

G. applanatum, which is almost exclusively saprophytic, closely resembles *G. pseudoferreum* on superficial inspection, but may be readily distinguished by the dark brown or black coloration of the tissues of the sporophore, in contrast to the pale cinnamon of the red root fungus.

G. lucidum [ibid., iv, p. 565] is a typical wound parasite of tea, *Acacia*, *Albizzia*, and *Cassia*. In Java *C. siamea* is severely attacked, while rubber and coffee are also affected. The salmon-pink to crimson, purple, or dark reddish-brown fructifications

develop as flat brackets against the trunks, mostly of dead trees, though the fungus may behave as a true parasite under certain conditions. The reddish-brown, zonate, white-bordered specimens may be confused with the fructifications of *G. pseudoferreum*, but the shiny, varnished appearance of the covering crust is a distinguishing feature of *G. lucidum*. The snow-white mycelium of the latter resembles that of the white root rot fungus [*Fomes lignosus*].

The red-lead coloured fructifications of *Polystictus sanguineus* are sometimes mistaken for those of *G. pseudoferreum*, though the former really resembles *F. lignosus* more closely.

Brief instructions are given for the control of root fungi by trenching to isolate infected areas, and it is suggested that soil applications of a mixture of lime and sulphur, which have proved effective in the West Indies, might also be tested in Java.

TUNSTALL (A. C.). **Observations on the treatment of fungus diseases.**—*Quart. Journ. Indian Tea Assoc., 1926*, 4, pp. 157–169, 1927.

A brief account is given of the progress made in the development of general cultural methods and direct fungicidal treatment for the control of fungous diseases of the tea bush in India. With a view to general improvement in the health of the bushes, the whole crop should be sprayed with lime-sulphur immediately after pruning, and again soon after the appearance of the new leaf. For use on isolated bushes Burgundy mixture is recommended, with an adhesive consisting of 1 lb. washing soda, 2 lb. resin, and 1 gall. water. The most satisfactory method of treating pruning cuts is spraying with lime-sulphur immediately after the operation, when the larger cuts may also be coated with a paste of fresh cow-dung and mud [cf. *R.A.M.*, vi, p. 128].

The estimated annual cost per acre of two applications of lime-sulphur is Rs. 11·5 [about 17*s.*]. Simple directions are given for the control of fungous diseases by thorough sanitation and appropriate treatment, and a table is given showing the organs attacked by the various parasites, with remarks on remedial measures.

VALLEAU (W. D.) & JOHNSON (E. M.). **Commercial tobaccos and cured leaf as sources of Tobacco mosaic.**—Abs. in *Phytopath.*, xvii, 1, p. 49, 1927.

Inoculation experiments both in the field and in greenhouses, in which the inoculum was obtained from various brands of commercial tobacco (plug, cigarette, and pipe) and from air-cured tobacco leaves of different origin and age, showed that these may be the source of mosaic disease in tobacco. Almost 100 per cent. infection was obtained with inoculum from air-cured leaf five years old, and there was also evidence that the infective principle is still active in dried tobacco after 18 to 30 years. Field tests indicated that primary infection of tobacco seedlings caused by labourers who use tobacco during their work may be almost entirely avoided by requiring the workmen to use heat-sterilized tobacco.

D'ANGREMOND (A.). **Nadere gegevens over bestrijding van veldschimmel (Oidium spec.) in de Vorstenlanden (3de publicatie).** [Further data concerning the control of the field fungus (*Oidium* sp.) in the Vorstenland. (Third note).]—*Meded. Proefstat. Vorstenlandsche Tabak*, lvi, 48 pp., 1 pl., 2 diags., 1926. [English summary. Received June, 1927.]

Further experiments were carried out during 1925 and 1926 in the control of tobacco mildew (*Oidium* sp.) in the Vorstenland [*R.A.M.*, vi, p. 60]. No correlation was found to exist between the application of sulphate of ammonia (with or without superphosphate) and an increased intensity of the disease. It was shown that sprinkling the soil with finely powdered sulphur at the rate of about 170 kg. per hect. gave satisfactory control of mildew under normal weather conditions. Good results were also obtained by spraying the leaves with calcium polysulphide, potassium polysulphide, or copper sulphite, but, as in the case of sulphur dust, minute particles of these preparations remained on the leaves: this form of treatment must therefore be abandoned. Soda, bicarbonate of soda, salicylic acid, and copper borate failed to give adequate control, while spraying with permanganate of potash increased the incidence of infection. Very promising results have been obtained during the two last seasons by the application of sulphur at an incipient stage of the disease, or even before the appearance of any symptoms. It is thought that even under unfavourable weather conditions such very early applications may prove extremely beneficial.

WHITE (R. P.). **Studies on Tomato wilt caused by Fusarium lycopersici Sacc.**—*Journ. Agric. Res.*, xxxiv, 3, pp. 197–239, 9 pl., 9 graphs, 1927.

Tomato wilt, caused by *Fusarium lycopersici*, is stated to be gradually increasing in economic importance in the more northern and cooler tomato-growing areas of the United States, especially in seasons when high temperatures are prevalent. It was also noted that, in several cases, tomato varieties resistant to the fungus in one locality exhibited varying degrees of susceptibility when grown in another locality, and the scope of the present investigation was to determine whether this difference is due to different degrees of pathogenicity of various strains of the organism. The experiments [full details of which are given] were carried out in the laboratory and greenhouses of the Kansas Agricultural Experiment Station, and covered 24 strains of *F. lycopersici* isolated from wilted tomato plants received from various parts of the country. Five of these were found to be especially virulent in their attack upon tomato seedlings, and markedly more destructive than the remaining 19 strains. They also differed from the latter by a slightly wider temperature range, more rapid rates of growth, and certain cultural characters.

Differences were noted in the behaviour of the strains in regard to the hydrogen-ion concentration of the substratum, but no correlation was found between these differences and the other characteristics of the strains. The limits of acidity and alkalinity tolerated were determined as approximately P_H 2·2 to 3·1 and 8·6 to 10·4,

and there were two maxima for growth, the first appearing at a range of 4·5 to 5·5, a minimum at 6 to 6·5, and the second maximum usually above 7; in three cases the latter appeared just below neutrality. When grown on Richards's solution with an initial P_H of 4, the organism reduces the acidity of the substratum until a constant of 8·8 is reached, after which its development is inhibited; in solutions with an initial P_H of 7, slight increases occur until the sugar disappears, when the reaction is rapidly altered to a value of P_H 8 and over; in solutions with an initial P_H of 9, increases in acidity take place with little growth of the fungi, until a minimum of 6·1 to 6·2 is reached, when the same occurs as in the preceding case.

When grown on a modified Richards's solution (in which sucrose is replaced by glucose), all the strains produced substances in the substratum which were shown to be highly toxic to cut tomato plants, but not to rooted plants grown in water cultures. These toxic substances were separated by physico-chemical means into two classes: the first colloidal, thermolabile, and of the nature of an enzyme; the second crystalloidal, dialysable, thermostable, and comprising both volatile and non-volatile fractions. Old culture solutions contained salts of organic acids, and organic acids were shown by tests to be highly toxic to tomato plants. Plants of a resistant strain of tomato proved to be less susceptible to the action of these substances than those of a susceptible variety. The toxic substances also produced wilting of cowpea, soy-bean, and cabbage. Wilting of tomato plants was also obtained with the toxic substances secreted by *F. oxysporum*.

DRECHSLER (C.). **Two water moulds causing Tomato rootlet injury.**—*Journ. Agric. Res.*, xxxiv, 3, pp. 287–296, 2 figs., 1927.

A description is given of two water moulds which were found occasionally causing discoloration and death of the rootlets of tomato seedlings in greenhouses in the United States. The first generally agreed in its morphology with *Aphanomyces euteiches* [*R.A.M.*, iv, p. 580], and is provisionally identified as this species, although its pathogenicity to peas was not established by cross-inoculations. The fungus did not appear to cause severe damage to tomato seedlings, but the fact that it was found parasitizing the rootlets of this plant may play an important part in crop-rotation schemes where both tomatoes and peas are cultivated on a commercial scale.

The other mould, similar to the former in its relationship to the host, is described as the type of a new genus (*Plectospira*), resembling *Aphanomyces* in general habit and in zoospore formation, but differing from it in having a differentiated zoosporangium typically composed of an involved complex of inflated elements and a filamentous efferent hypha. It is named *P. myriandra*, and English diagnoses are given of the new genus and species.

RHOADS (A. S.). **Clitocybe root-rot of trees and other woody plants in Florida.**—Abs. in *Phytopath.*, xvii, 1, pp. 56–57, 1927.

Clitocybe tabescens, which was previously recorded by the author

as the cause of a root rot of the vine in Missouri [*R.A.M.*, iv, p. 585], was observed during the past three years attacking and killing eucalyptus trees, *Casuarina equisetifolia*, rose apples (*Caryophyllus* [*Eugenia*] *jambos*), poinsettias (*Euphorbia pulcherrima*), and guavas (*Psidium guajava*) in various localities of Florida. Although the disease was frequently found destroying guava trees in long-established citrus groves, in no instance were the latter observed to be attacked by the fungus.

PRILLWITZ (P. M.). **Vergelijkende beschouwingen over de grijze Dadapschimmel en hare bestrijding.** [Comparative observations on the grey Dadap fungus and its control.]—*De Thee*, vii, 3, pp. 91–94, 1 pl., 1926. [Received May, 1927.]

A brief account, based chiefly on the investigations of Petch, Bernard, and Steinmann, is given of the grey dadap fungus (*Septobasidium bogoriense*) [*R.A.M.*, v, p. 253; vi, p. 1].

LINDEN (Gräfin v.), ZENNECK (LYDIA), & GÜNTHER. **Untersuchungen über das Ulmensterben in den Beständen der städtischen Gartenverwaltung der Stadt Bonn und anderer Orte.** [Investigations on the die-back of Elms in the stands of the urban garden administration of the town of Bonn and elsewhere.]—*Centralbl. für Bakt.*, Ab. 2, lxix, 15–24, pp. 340–351, 1927.

The die-back of elm trees [*R.A.M.*, vi, p. 385] is stated to be characterized at Bonn, where it has caused severe damage, by symptoms similar to those originally described by Miss Schwarz [ibid., ii, p. 92]. The leaves wither without discoloration or dropping, and yellow to brown spots of fair dimensions develop in the cambium and wood of affected trees. Mycological investigation of these trees, and of specimens received from other places, constantly yielded a fungus agreeing in all respects with the budding form of *Graphium ulmi* [loc. cit.]. Bacteria were not constantly found. The Stilbaceous stage described by Miss Schwarz did not develop on the media used by the writers (glycerine agar, agar rich in condensed water as used for culturing amoebae, and sterile tap water), but hyphal growths were obtained. Healthy lime and elm branches placed in glass vessels containing water suspensions of pure cultures of the fungus developed the typical wilting associated with the disease. The strong smell of alcohol emitted by the cultures, and also by large branches of a diseased elm kept in the laboratory, pointed to the fermentation by the fungus of the sugar-containing sap of the trees. It is also possible that a toxic effect may be produced on the foliage, through the tracheae, by these fermentation products. Similar effects were produced on a healthy lime branch by the addition of 3 per cent. ethyl alcohol to the tap water.

SCHERER (C. M.). **Tree injection for control of fungous diseases and insect pests.**—Abs. in *Phytopath.*, xvii, 1, p. 51, 1927.

An attempt during the summer of 1926 to control chestnut blight (*Endothia parasitica*) by injecting a large range of antiseptics [a list of which is given] into American chestnuts (*Castanea dentata*) gave negative results. Apple trees injected with thymol appeared

to show a definite resistance to the progress of fireblight (*Bacillus amylovorus*).

RESSENCOURT. **Recherches sur un Oïdium du Mûrier.** [Researches on an *Oidium* on Mulberry.]—*Bull. Econ. de l'Indochine*, xxx, 183, pp. 41–62, 1927.

This paper records the results of a study in 1923 and 1924 of the symptoms and etiology of a disease found in Tonkin on mulberry leaves, discusses the detrimental changes effected in the nutritive value of the leaves, especially in relation to their use in silkworm rearing, and suggests remedies.

The cause of disease was identified, by means of its perithecia, as a species of *Phyllactinia* and is thought to be at least closely related to *P. corylea* [*R.A.M.*, vi, p. 398]. It forms a greyish-white, cobwebby growth on the under surface of the leaves. The conidiophores were few in number, elongated, rigid, and with only a single distinguishable conidium at the apex of each. Branches of the mycelium penetrated the stomata and extended as far as the palisade parenchyma, sending haustoria into the cells.

The disease usually attacks, from March to May, mulberry trees subjected to the normal annual pruning, but may appear in milder form at intervals between July and October. Its active development is favoured by temperatures of 20° to 25° C. and retarded at 30° or over, as well as by intense damp or heavy rain.

Analyses of healthy and mildewed leaves showed that the latter had about 5 per cent. less moisture and much more silica and lime (about 0·8 and 0·25 per cent., respectively) than healthy leaves, variations in the other elements being less definite.

A detailed account of the detrimental effects observed on silkworms fed with mildewed leaves is given, based on controlled experiments. These effects spring partly from the loss of appetite engendered by feeding on diseased leaves, and partly from the excess of lime and silica in the latter. The effect on the silkworm of the ingestion of diseased leaf was found to vary with the portion of the leaf blade attacked and the stage of development of the parasite. In general, feeding on diseased leaves caused a diminution in the number and weight of eggs, and in the volume and weight of the worms, an increased tendency to diseases such as grasserie and flacherie, a reduction in the number and weight of cocoons, and deterioration in the quality of the silk.

Sulphur cannot be used as a preventive, as it scorches the leaves and the residue adhering to them affects the silkworms. The author advocates the early gathering of all leaves growing near the base of the trunk and the ground, and the lopping of all twigs shooting from the bases of the principal stems or from underground shoots. Where the trees are infected, it is advisable to avoid winter rearing of silkworms, since this necessitates the maintenance of unpruned trees and promotes the development of the disease. Early pruning is also advised. The question of the advisability of cultivating dwarf mulberries in place of planting in thickets and hedges is briefly discussed. Great care should be taken to avoid gathering diseased leaves to feed the silkworm during the first four periods of its life. Since, after the fourth moult, the large quantity of

nutriment required precludes the selection of leaves while harvesting, they must be sorted in order to eliminate all leaves on which the mildew spots are russet-brown, a stage usually corresponding to a high silica and lime content.

APPEN (A. v.). **Weidenschorf (Fusicladium saliciperdum).** [Willow scab (*Fusicladium saliciperdum*).]—*Illus. Landw. Zeit.*, xlvii, 5, pp. 67–68, 1927.

During the wet seasons of 1925 and 1926 (especially the latter year) willow plantations in Germany were devastated by severe attacks of scab (*Fusicladium saliciperdum*), which was most prevalent on *Salix americana*, while *S. viminalis* and *S. purpurea* were also affected to a slighter extent. The twigs of infected trees are stunted and discoloured, with dry, brown tips and leaves, and a shrivelled bark. The disease is thought to have been favoured by the excessive absorption of nitrogen from the saturated soil. Fertilizing with calcium cyanamide increased infection. Spring and autumn pruning appears to be an effective control measure.

WEBSTER (A. D.). **Diseases of the cricket-bat Willow.**—*Royal Bot. Soc. of London, Quart. Summary*, xxxi, pp. 6–8, 1 fig., 1927.

In connexion with the appearance and spread of the 'watermark' disease of willows [*Salix caerulea*] in the eastern counties of England [noticed in detail by Day, *R.A.M.*, iv, p. 321], the author gives a description of the external symptoms as observed on an estate near Chelmsford [Essex]. The disease was first noticeable in the thin, wilted appearance of parts of the crown foliage, in most cases speedily followed by the death of the upper branches, and ultimately of the whole tree.

An examination of willow trees on several estates has shown that the conditions under which attacks take place and the duration of the disease are similar in different localities. There is no doubt that stagnant root moisture favours attack, but the author considers that the method of growing the bat-making willow for commercial purposes by setting stout poles, usually 8 feet by 3 inches, is responsible to a large extent for the present unhealthy condition of some of the trees.

JOHNSON (H. M.), HANZLIK (E. J.), & GIBBONS (W. H.). **Red Alder of the Pacific Northwest: its utilization, with notes on growth and management.**—*U.S. Dept. of Agric. Bull.* 1437, 46 pp., 11 figs., 1926.

Among the principal defects in red alder (*Alnus rubra*) are black knots and occasional rotten streaks. White heart rot due to *Fomes igniarius* is the most important disease. This fungus also destroys the wood of dead trees, reducing it to a yellowish-white, spongy mass. A canker disease sometimes kills the young trees, and twigs or branches of older trees. The total economic loss from disease is trifling. The wood when used for posts lasts only two to three years. Durability is estimated at but 25 to 35 per cent. of that of *Quercus alba*, and it is also less than that of four western coniferous woods with which it is compared.

A consignment of red alder logs stored at the Forest Products Laboratory, Madison, Wisconsin, showed within a short time abundant decay from the common white rot caused by *Polystictus versicolor* and *P. hirsutus*.

WEIR (J. R.). **The problem of Dichrostachys nutans, a weed tree, in Cuba, with remarks on its pathology.**—*Phytopath.*, xvii, 3, pp. 137–146, 3 pl., 4 figs., 1927.

The marabu tree *Dichrostachys nutans* (the inordinate spread of which in Cuba is stated to have become a serious menace on arable lands) was found in some parts of the island to be widely attacked and killed by *Ganoderma pulverulentum*, which enters through wounds, causing a white, undifferentiated rot of the heartwood; and by *Ustulina zonata*, which is considered to be the primary cause of the death of the trees. Even before the tree dies, the fructifications of this fungus appear around the base or on the lateral roots, first as small pustules which enlarge, become confluent, and eventually form broad, soft, white or greyish-white plates of several inches in extent, at which stage conidia are produced on the surface. Later the plates harden and change colour to greyish-green, then purple-black, and finally entirely black, with small black dots on the surface, which are the openings to the perithecia.

Investigations are in progress to test the possibility of using *U. zonata* for the eradication of the marabu tree, and the author is inclined to believe, since it was found especially associated with this tree, that it may be a specialized strain of the fungus which will not attack economically important plants in the country.

HAGEM (O.). **Beretning om Stationens virksomhet fra 1 Juli 1923 til 30 Juni 1926. 5. Undersøkelser over Furuens naalefaeldning—schütte og vindsvidning.** [Report on the work of the Station from 1st July, 1923, to 30th June, 1926. 5. Investigations on needle drop of the Pine—leaf fall and wind scorch.]—*Vestlandets Forstl. Forsøksstat. Meddel.* 10, pp. 23–44, 1927.

This is a condensed account of the author's exhaustive investigation of leaf fall of Scotch pines [*Pinus sylvestris*], associated with *Lophodermium pinastri* and wind scorch, in western Norway [*R.A.M.*, vi, p. 452].

MOURASHKINSKY (K. E.). Лиственничная губка. [Larch sponge fungus.]—Pamphlet published by the Siberian Institute of Agriculture and Forestry, Omsk, 20 pp., 2 figs., 1927.

This is a semi-popular account of the damage done in Siberia by *Polyporus officinalis* to larch (*Larix sibirica*), which is stated to be extensively attacked by this fungus in all the woodland districts. In some cases hymenophores of the fungus were also found on the Siberian cedar (*Pinus sibirica*). A brief account is given of the macroscopical symptoms and of the morphology of the fungus, which allow of distinguishing it from another locally common rot of conifers, caused by *P. sulphureus*. Control measures should consist in improved silvicultural practices in larch woods, and in

the elimination of infected trees, débris, and decaying stumps in the forests. It is pointed out, however, that the hymenophores are of some economic importance, as they are used for pharmaceutical purposes; the price paid to the collectors varies from 5 to 10 roubles [10 to 20 shillings] per pood [36 lb.] and the annual exportation amounts to several thousand poods. The pamphlet terminates by a table giving the macroscopical symptoms of the most common rots of the larch and *P. sibirica* which occur in Siberia.

TUBEUF (C. v.). **Aufruf zum Anbau der rumelischen Strobe, Pinus peuce an Stelle der nordostamerikanischen Weymouthskiefer, Pinus strobus und der westamerikanischen Strobe, Pinus monticola.** [Appeal for the cultivation of the Rumelian *Strobus, Pinus peuce,* instead of the north-east American Weymouth Pine, *Pinus strobus,* and the west American *Strobus, Pinus monticola.*]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz,* xxxvii, 1–2, pp. 6–8, 1927.

The writer briefly outlines the white pine blister rust [*Cronartium ribicola*] situation in Europe and America, and renews his appeal for the cultivation of the resistant *Pinus peuce* [*R.A.M.*, v, p. 639] in place of the susceptible *P. strobus* and *P. monticola.* The importation into Germany of American five-needled pines should be prohibited. The cultivation of the Dutch red currant, which appears to be highly resistant to blister rust [ibid., ii, p. 483], should be encouraged. Attention is called to the difficulty of procuring seed of *P. peuce* from the Balkans and to the consequent necessity of saving the cones.

KÜRSCHNER (K.). **Ueber die humifizierende Einwirkung von Merulius lacrymans auf Hölzer.** [On the humifying effect of *Merulius lacrymans* on timber.]—*Zeitschr. Angew. Chemie,* xl, 8, pp. 224–232, 5 figs., 1927.

Certain wood rotting fungi, especially the dry rot fungus, *Merulius lacrymans,* destroy the greater part of the cellulose in timber. The carbohydrate constituents of the lignin substance are more or less extensively separated out and consumed, leaving behind very resistant, polymeric, aromatic complexes; the lignin is ultimately transformed into a brownish body soluble in alkali and partly soluble in water and acid, which is identifiable with humic acids [*R.A.M.*, iv, p. 628]. It is probable that the residue of the polymeric carbohydrates left behind in more or less altered form (cellulose, pentosans, &c.), also form an appreciable part of the mass. The main final products of highly decayed timber which has been for some time subjected to fungous attack would, therefore, be polymeric coniferyl alcohol and higher-molecular cellulose-disintegration products; the subsidiary products, unaltered cellulose, unaltered lignin, pentosans, and some fungous matter.

DOYER (CATHARINA M.). **Ein Pilzparasit des Hausschwammes.** [A fungous parasite of the dry rot fungus.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten', Baarn (Holland),* x, pp. 32–34, 3 figs., 1927.

Merulius lacrymans in a culture tube at the Delft Micro-

biological Laboratory was found to be infected by a fungus which has been named *Myceliophthora fusca* n. sp. This organism differs from *M. lutea*, a parasite of mushrooms, in the absence of conidial chains and chlamydospores, and in the profuse formation of clamp-connexions on all the hyphae including the conidiophores. The mycelium forms a few extremely tenuous septa. The conidia, which develop in large numbers on cherry and malt agar in 19 to 20 days, are oval, dark ochre or pale chocolate coloured, and measure 6·5 to 10 by 3·5 to 6·5 μ. Pure cultures were not obtained. The typical growth of the dry rot fungus is inhibited by the invasion of *M. fusca*.

HAENSELER (C. M.). **Studies on the root rot of Peas (Pisum sativum) caused by Aphanomyces euteiches Drechsler.**—*Forty-sixth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1925*, pp. 467–484, 3 pl., 1926. [Received May, 1927.]

The typical symptoms [which are described] of root rot of peas (*Aphanomyces euteiches*) are stated to be readily produced by placing a zoospore suspension of the fungus in direct contact with the base of the plant. Zoospores may be obtained in abundance by growing the organism in agar for three to four days, then cutting out the growing edge of the colony and placing it in sterile tap water for 24 hours. The zoospores may cause infection at any time from five to seven days after formation.

Peas are susceptible to infection from germination to maturity, though the disease develops more slowly on older plants. The zoospores appear to be incapable of migrating even half an inch in the soil, so that there is little or no spread of infection during the growing season.

As in a previous experiment [*R.A.M.*, v, p. 400], root rot was again most prevalent at high soil moistures up to saturation, while no infection occurred between 40 and 20 per cent. of the water-holding capacity. The greatest losses were found to occur when the soil was warm and wet during the infection period, followed by extreme drought just before maturity.

In greenhouse tests, Canada field peas were found to be as susceptible as garden peas. Hairy vetch [*Vicia hirsuta*] also became infected, mature oogonia of the fungus being found in the cortex of the diseased roots. Negative results followed the inoculation of various species of clover, and of lucerne, kidney beans [*Phaseolus vulgaris*], soy-bean, cowpea, *V. faba*, and maize [cf. ibid., vi, p. 388, and next abstract].

LINFORD (M. B.). **Additional hosts of Aphanomyces euteiches, the Pea root rot fungus.**—*Phytopath.*, xvii, 2, pp. 133–134, 1927.

Field observations in Wisconsin are stated to indicate that the causal organism of root rot of peas (*Aphanomyces euteiches*) has a wide range of potential host plants [see also last abstract]. In 1925, narrow-leaved vetch (*Vicia angustifolia*) was found with characteristically decayed roots containing typical oospores of the fungus. Similar observations were made in 1926 on seedlings of

lucerne, sweet clover (*Melilotus alba*), an undetermined species of grass, and the roots of barley and oats, the two last-named containing oospores. At McMillan, Michigan, sweet peas (*Lathyrus odoratus*) were found to be much weakened by the attacks of the fungus.

Of 15 species of leguminous plants grown from seed in the greenhouse in naturally infected soil during the winter of 1925–6, the following (in addition to the above-mentioned) proved susceptible: *Lathyrus* sp. from northern Utah, *L. latifolius*, *Vicia sativa*, *V. pannonica*, *V. monantha*, *V. gigantea*, *V. fulgens*, *V. ervilia*, and *V. dasycarpa*. An undetermined monocotyledon accidentally found in the soil used in these trials also developed root rot. No pure culture inoculations were made, but the characteristic morphology of the oospores of *A. euteiches* simplifies the positive identification of the parasite.

None of these additional hosts appears to be as susceptible as peas, though in greenhouse trials certain species of *Vicia* and *Lathyrus* were killed soon after emergence.

This extension of the hosts of *A. euteiches* suggests that the fungus may live as a weak parasite in the roots of a wide range of plants, and also that it may occur naturally in some virgin soils Root rot has been observed several times in Wisconsin in recently cleared ground where peas were planted for the first time. The remarkably long persistence of the parasite in soils once thoroughly infested is now explicable, and the wide range of hosts accounts for the failure of crop rotation completely to eradicate the fungus.

NOLLA (J. A. B.). **A new Alternaria disease of Onions (Allium cepa L.).**—*Phytopath.*, xvii, 2, pp. 115–132, 3 pl., 1927.

During December, 1924, and January, 1925, there was a very severe outbreak of an apparently new disease of market onions and false shallots (*Allium cepa* var.) in three localities of Porto Rico.

The disease, for which the name purple leaf spot is proposed, causes numerous white, circular or irregular spots, less than 1 mm. in diameter, which gradually deepen to a dark violet or reddish-purple colour, on the leaves and pedicels. In advanced stages of infection the spots are surrounded by a pale orange-yellow to salmon band, which is encircled by a light green zone. A distinct yellowish discoloration usually extends from the spots to the tips and bases of the leaves. The pedicels are frequently girdled and killed before the seeds are mature. On the false shallot the lesions are smaller and paler than on onion leaves.

Abundant conidia of the causal organism, which has been named *Alternaria allii* n. sp. (with an English diagnosis), develop on the lesions. They measure 105 to 320 by 12 to 24 μ and frequently possess compound beaks, by which, as well as by their larger dimensions, they may be distinguished from *Macrosporium* (*A.*) *porri* (*Ann. Rept. Connecticut Agric. Exper. Stat. 1889*, p. 161, 1890). It is thought that the species may possibly prove to be identical with that recorded (but not described) by Ajrekar from India [*R.A.M.*, iii, p. 570].

The cultural characters and life-history of the fungus are fully

described. The best growth was made on acid, starch-containing media. Colour changes, similar to those occurring in nature, were induced in all solid media, and also in onion decoctions. Inoculations by spraying six healthy plants growing in clay pots under field conditions with a spore-suspension of the fungus resulted in the appearance of small, whitish, necrotic areas on the leaves. Experiments in which plants were sprayed with a mycelial suspension or inoculated through needle-pricks also gave positive results.

The conidia are short-lived, being very susceptible to desiccation and direct sunlight. Germination and invasion apparently occur at night or in cloudy weather, and only in water films. Ideal field conditions for the development of infection are provided by warm weather with occasional rain and little sunshine.

The pathogen appears to overwinter in the mycelial condition on onion leaf débris in the soil, from which a crop of conidia for primary infection is produced.

The conidia are relatively resistant to copper sulphate and germinate normally in dilutions of 1 in 10,000, though development was almost completely inhibited at 1 in 1,000. Possibly dusts with a high copper content might prove efficacious in the control of the disease, but ordinary Bordeaux mixture is not likely to be of much value. Crop rotation might be of some use, but control by ordinary sanitary measures appears impracticable.

VAN BEYMA THOE KINGMA (F. H.). **Ueber eine neue Sclerotinia-Art auf Porreesamen (Allium porrum), Sclerotinia porri nov. spec.** [On a new species of *Sclerotinia* on Leek seed (*Allium porrum*), *Sclerotinia porri* n. sp.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten', Baarn (Holland)*, x, pp. 43–46, 10 figs., 1927.

In the spring of 1926 the writer examined a consignment of leek (*Allium porrum*) seeds infected by a fungus which at first appeared to be the ordinary grey mould (*Botrytis cinerea*). Pure cultures on beerwort agar, however, showed marked divergences, of which the most striking was the development of large, irregular, broad and concave or almost circular and high, corrugated sclerotia, measuring up to 20 mm. in height and 35 mm. in width, white at first but turning black later and secreting drops of oxalic acid.

The conidiophores of the leek fungus differ from those of *B. cinerea* in their smaller size, seldom exceeding 1 mm. in height, and in the absence of the typical ramifications with numerous compact spore heads. There are generally two to four furcate branches, but the apical ramifications are so short (50 to 100 μ long) that the spore heads appear almost sessile.

The hyaline, oval or elongated spores measure 10 to 12 by 8 to 10 μ and germinate readily in water with one or two germ-tubes.

In the following summer the cultures were soaked in formalin with a view to killing the fungus and left standing till November, but they then developed more or less deformed apothecia. Sclerotia in a flower-pot out-of-doors developed normal apothecia in three months. The stalks are orange-coloured, straight, trumpet- to bell-shaped, about 20 mm. in height, the lower half covered with short,

fine hairs, increasing in thickness from 2 mm. at the base to 12 mm. at the apex, opening out into a funnel-shaped, smooth, waxy, reddish-violet hymenium.

The asci are cylindrical-clavate, 175 to 200 by ± 12 μ, and contain eight irregular, elongated to circular, hyaline ascospores, measuring 15 to 23 by 8 to 10 μ and having an oil-drop at each end.

The conidial stage readily developed from a single germinated ascospore transferred from malt gelatine to beerwort agar, thereby confirming the identity of the *Botrytis* with the sclerotial and apothecial stages. The fungus has been named *Sclerotinia porri* n. sp. This is believed to be only the second record of a proved connexion between *Botrytis* and *Sclerotinia*, the first occurring in the grey mould of castor bean (*S. ricini*) [*R.A.M.*, iii, p. 377].

LIESKE (R.). **Untersuchungen über die als Mauke oder Grind bezeichnete Erkrankung der Weinreben.** [Investigations on the Vine disease known as scab or scurf.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xv, 2, pp. 261–270, 2 pl., 1927.

A concise summary is given of the work of previous investigators on the vine disease known in Germany as 'mauke' or 'grind' [*R.A.M.*, vi, p. 270]; in France as 'broussin' or 'broussins'; in Italy as 'rogna' or 'malattia dei tubercoli'; and in the United States as 'black knot'. The disease has also been recorded in Holland, Spain, Chile, and Australia, and appears to be prevalent in all vine-growing countries.

The tumours caused by the disease are most often found on the vine stocks at a height of 20 to 30 cm. above soil level. Smaller excrescences occasionally occur up to 1 m. from the ground and the collar and upper parts of the roots are also often infected. The disease has never been observed on young shoots, apparently occurring only on overwintered wood, and susceptibility increases with the age of the vines. The cankers, which originate as slight elongated swellings, rapidly expand and rupture the outer bark. On old stocks they frequently reach a length of 20 to 30 cm., and ultimately the size of the cankers may considerably exceed the original thickness of the stem. Both in external appearance and internal structure the 'mauke' tumours resemble those produced by *Bacterium tumefaciens*, though the large dimensions of the vine cankers are an exceptional feature.

In the spring of 1926 the causal organism of the 'mauke' disease was readily isolated from a number of grafted vines from Berncastel-Cues [Moselle Valley] and grown in pure culture on a malt extract and agar medium. In the following October it was also isolated from an old stock from Naumburg. In the latter case the bacteria closely resembled a strain of *Bact. tumefaciens* supplied by E. F. Smith, but those isolated from the grafted vines showed considerable divergences, since milk was coagulated more slowly but then dissolved more rapidly, litmus milk was turned blue instead of red, and the colonies, which did not stain with acid fuchsin, were compact, almost cartilaginous, and markedly rugose in contrast to the smooth, viscous masses of the Smith and Naumburg strains. These variations are regarded as falling well within

the natural limits of diversity in *Bact. tumefaciens*, to which the disease in both the above-mentioned localities is ascribed.

A number of needle-prick inoculation experiments were carried out with the Berncastel strain of *Bact. tumefaciens* on vines, beets, tomatoes, pelargoniums, willows, poplars, *Crataegus*, *Solanum* spp., and other plants. Positive results were obtained in every case and the bacterium was readily reisolated from the tumours. The virulence of the organism appeared to increase with the length of cultivation. Particular attention was given to the experiments with vines, which were inoculated, with and without wounding, both above and below soil level and at various points in the stock. The typical symptoms of 'mauke' were produced in every case of needle-prick inoculation, but not without wounding. Inoculation experiments on young shoots also gave positive results, although in nature this type of infection has not been observed. On Virginia creeper (*Ampelopsis* [*Parthenocissus*] *quinquefolia*) the tumours developed more rapidly and assumed larger dimensions than on vines.

The transmission of the disease probably takes place through the soil, and the fact that *Bact. tumefaciens* thrives in damp soils explains the prevalence of the disease under such conditions. Drying out of the soil and the avoidance of situations exposed to late frosts (which have been observed to favour infection, as in the case of *Pseudomonas savastanoi* on the olive [*R.A.M.*, v, p. 674]) have long been successfully advocated for the control of 'mauke', and these measures should be further adopted. The tumours should be excised during the winter, all infected material burnt, and the wounds treated with a standard preservative in order to prevent reinfection by the organism.

WORMALD (H.). **Notes on plant diseases in 1925.**—*Ann. Rept. East Malling Res. Stat. 1925, II Supplement*, pp. 75–86, 4 pl., 1927.

The year 1925 was characterized by two long periods of generally wet weather separated by a comparatively dry spell, and these conditions were reflected in the varying incidence of plant diseases.

Bitter pit and glassiness or water core of apples [*R.A.M.*, iii, p. 655; vi, p. 166], generally attributed to sudden fluctuations of sap pressure as a result of weather changes, were prevalent in the autumn. Internal breakdown [ibid., vi, p. 301], probably associated with the exceptionally low temperature at picking time, caused considerable losses among stored Bramley's Seedling and Lane's Prince Albert apples during November. A rot of stored apples has been found to be caused by *Gloeosporium album* [ibid., iv, p. 226].

Cherry trees were affected by 'rust', which causes the rupture of the cortex, exposing a rust-like powder consisting of collapsed, dry, rectangular, readily separable cells. The condition is thought to be non-parasitic.

The flowering Japanese cherry (*Prunus serrulata*), *Pyrus elaeagrifolia*, and quinces were attacked by *Sclerotinia cinerea*, which appears to be very rare on the last-named host.

Pyrus ringo and *P. riversii* were attacked by scab (probably *Venturia inaequalis*), the pedicels and calyx being infected in both hosts and the petals in the former only. It is considered likely that these highly susceptible species of *Pyrus* may prove a dangerous source of infection for the cultivated varieties.

Marked differences have been observed in the varietal susceptibility of quinces to fruit and leaf spot (*Fabraea maculata*) and mildew (*Podosphaera leucotricha*).

Roesleria hypogaea [ibid., v, p. 278] was found on the lower end of the stocks and roots of grafted one- and two-year-old plum trees of the Victoria, Czar, Monarch, Purple Egg, and Pond's Seedling varieties. The fungus, which is usually supposed to be parasitic, appeared to have caused little or no damage.

Both the conidial and perfect stages of the causal organism of raspberry anthracnose (*Gloeosporium venetum* and *Plectodiscella veneta*) were found on diseased canes. *Didymella applanata* [ibid., ii, p. 128] also seems to have caused a certain amount of damage to the crop. Mosaic disease of raspberries appears to have been unusually virulent during 1925.

Black currants of the Baldwin variety were severely damaged by leaf spot (*Pseudopeziza ribis*). American gooseberry mildew (*Sphaerotheca mors-uvae*) was also observed on this host.

A bacterium was isolated from the cracked, cankered bark of Catillac pear trees, but its parasitism has not yet been tested. Bacteria were also associated with leaf spot of Fertility pears, and preliminary inoculations with an organism isolated from diseased material gave positive results.

A bacterial leaf spot of walnuts, caused apparently by *Pseudomonas juglandis*, is under investigation.

French beans were attacked by a bacterial disease resembling that due to *Bacterium phaseoli* [ibid., i, p. 151].

Broccoli and Savoy cabbage showed the typical symptoms of black rot [ibid., vi, p. 330], and an organism resembling *Pseudomonas campestris* was isolated from infected material.

[Nattrass R. M.]. **Economic Mycology.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1926*, pp. 134–144, 1927.

Amongst the phytopathological matters of interest observed or reported during the year the following may be mentioned. Apple mildew [*Podosphaera leucotricha*] was particularly bad, especially on Bramley's Seedling, Bismarck, Allington Pippin, and Cox's Orange Pippin. A black rot of Worcester Pearmain apples during packing was observed. The pathogenicity of a pycnidial fungus occurring on the black affected areas was proved by inoculation, but owing to its failure to produce mature fructifications it has not yet been identified.

An unusual *Phytophthora* rot of pears, termed 'hard rot', and characterized by the discoloration of the skin, the endocarp, and minute flecks of vascular tissue, was noticed.

A species of *Fusarium* with 2- to 3-septate spores, 37 by 5 μ in diameter, was isolated from a raspberry cane suffering from die-back and crown rot. These spores agree with those of a *Fusarium*

isolated by Wormald in 1913 (*Journ. S.-E. Agric. Coll., Wye*, xxii, p. 481) from diseased raspberry plants, and have no resemblance to the conidial stage of *Nectria rubi*. Attempts to establish the pathogenicity to raspberries of the last-named fungus failed [see below, p. 565]. Anthracnose (*Gloeosporium venetum*) [*Plectodiscella veneta*] was serious on certain varieties, especially Baumforth. Mosaic disease was widespread, and is probably responsible for a falling off in yield, and the susceptibility to other diseases shown by affected raspberries. Growers continue to propagate from diseased stools.

Foot rot of wheat (chiefly *Ophiobolus cariceti*) [*O. graminis*] was particularly noticeable in Wiltshire, and was accompanied by a disappointing yield at threshing.

A canker of head-worked apple trees, due apparently to *Fuckelia conspicua*, was observed in Herefordshire. Growers were advised not to remove the young woody shoots until the grafts were well established.

The following willow diseases were noted: canker and die-back due to a *Physalospora*, apparently identical with *P. miyabeana* Fukushi; black canker (unidentified); and anthracnose of Red Welsh rods, due to a fungus identified as *Marssonina salicicola*. Fructifications of *Cytospora* sp., *Hendersonia rubi*, and *Coniothyrium fuckelii* were found on willow rod cankers. The presence of a *Gloeosporium* conidial stage in the life-history of the above-mentioned *Physalospora* was proved by cultural work. Inoculation experiments showed that both ascospores and conidia can infect unwounded leaves and growing points.

In a test of 11 Swiss varieties of potatoes said to be resistant to late blight (*Phytophthora infestans*), the four varieties Vor der Front, Vaterheim, Nogi, and Prof. Wohltmann showed resistance.

BEAUMONT (A.) & HODSON (W. E. H.). **Third Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1926.**—25 pp., 1927.

The present report, compiled much on the lines of the previous one [*R.A.M.*, v, p. 342], gives brief notes on the chief plant diseases recorded during the period under review. During 1926 heart or dry rot of mangolds and sugar beet (*Phoma betae*) was more severe than usual in Devon and Cornwall, this fact being ascribed to the hot weather that prevailed during the summer. Field observations indicated, however, that dry weather by itself is not, as sometimes stated, responsible for the diseased condition of the plants, but that excessive dryness favours the development of the fungus, which is unable to thrive on the plants unless they are weakened by drought. There was no evidence of the existence of any connexion between heart rot and black leg (though caused by the same fungus), as an attack of black leg is not necessarily followed by heart rot, and the latter may occur in fields where the former disease has never appeared. The disease seems to be absent from acid soils and does not appear to be controllable by seed disinfection methods.

Botrytis cinerea causes a serious die-back of gooseberries, which

rapidly kills the bushes. The disease appears to be common in Devon. The pathogenicity of the fungus was proved by experiments in which two healthy bushes of the Whinham's Industry variety were successfully inoculated with a culture obtained from gooseberry twigs. Notes are also given on the damage done by *B. cinerea* to other cultivated plants.

Of recent years gladiolus growers in Devon and Cornwall have suffered extensive losses from the hard rot disease of the corms caused by *Septoria gladioli* [ibid., v, p. 164]. The fungus does not kill the corms by itself, but prepares the way for secondary organisms normally unable to infect the healthy corms. There is evidence that the disease is cumulative, only becoming serious when the plants are grown in the same soil for a number of years. It is therefore recommended to lift the corms in the summer, select the healthy ones, and plant them in soil on which gladioli were not previously grown.

Tulip fire caused by *B. tulipae* [ibid., iv, p. 285] is stated to be widespread in both counties, and in many cases to have ruined the crop.

WAHL (B.). **Bericht über die Tätigkeit der Bundesanstalt für Pflanzenschutz in Wien im Jahre 1925.** [Report on the activity of the Federal Institute for Plant Protection in Vienna in the year 1925.]—Verlag der Bundesanst. für Pflanzenschutz, Wien II, 28 pp., 1926. [Received July, 1927.]

The following are some of the chief references of phytopathological interest in this report, which has been prepared on similar lines to those of former years [*R.A.M.*, v, p. 210]. A considerable increase in the sulphuric acid content was detected in specimens of various plants exposed to factory fumes [ibid., iv, p. 144].

The winter of 1924–5 was unusually mild and dry, followed by a cool, rainy spring, a predominantly wet summer, and a warm, dry autumn. Black and yellow rust of cereals (*Puccinia graminis* and *P. glumarum*) were of frequent occurrence, the latter being specially prevalent on wheat in Carinthia and the Burgenland. *P. simplex* and stripe disease (*Helminthosporium gramineum*) were unusually abundant on barley.

Late blight of potatoes (*Phytophthora infestans*) was much in evidence in districts with a heavy rainfall. Blackleg [*Bacillus atrosepticus*] was very widespread in the Tullner district, infection having been carried on Preussen seed-potatoes imported from Germany.

Cucumbers were heavily attacked by *Botrytis cinerea*, *Cladosporium cucumerinum*, and *Corynespora melonis*. Tomatoes were extensively infected by a bacterial disease of the stem vessels.

Serious damage was caused in the mushroom-beds of Vienna by *Mycogone perniciosa* [ibid., iv., p. 167].

Apricots and cherries suffered severely from the attacks of *Sclerotinia laxa*, which is stated to constitute a real danger to the apricot orchards of the Wachau region.

Native and American vines were heavily infected by roter brenner [*Pseudopeziza tracheiphila*], which in some cases developed unusually late (9th to 13th June).

Lilac [*Syringa vulgaris*] was attacked by *Fusarium sarcochroum*, hydrangeas by *Oidium hydrangeae*, and *Anthurium scherzerianum* by *Gloeosporium minutum* [ibid., v, p. 558], all of which are stated to be new records for Austria. *Helminthosporium echinulatum* occurred on carnations and *Coniothyrium wernsdorffiae* on roses.

Bunt of winter wheat [*Tilletia tritici* and *T. levis*] was well controlled by the following liquid preparations: higosan (Chinoin, Ujpest), Hohenheimer beize [urania: ibid., v, p. 114], germisan, salvocer [Ver. Chem. Fabr. Kreidl, Heller & Co., Vienna), segetan-neu, and uspulun. Dusting with uspulun at the rate of 300 and 400 gm. per kg. of seed-grain reduced the incidence of infection from 58 to 0·7 and 0·1 per cent., respectively, while porzol, applied at 200, 300, and 400 gm. per kg., practically eliminated the disease (0·2, 0·1, and almost nil, respectively). None of the above-mentioned disinfectants gave complete control of loose smut of oats [*Ustilago avenae*], but agfa (liquid) reduced infection from 19·8 to 0·1 per cent.

La Claimanteuse and Beauty of Boskoop apples, which are almost immune from *Monilia* [*Sclerotinia*], were found to possess a higher degree of acidity and a lower sugar content than several susceptible varieties, including White Astrachan. Good results in the control of apple mildew [*Podosphaera leucotricha*] were given by the application of ground sulphur, 1 or 1·25 per cent. erysit (Schering), and sulikoll [ibid., v, pp. 77, 238] in the order named. The last-named preparation, both in liquid and solid form, proved totally inadequate against the vine *Oidium* (*Uncinula necator*). Unsatisfactory results in the control of downy mildew of the vine (*Plasmopara viticola*) were given by 1·5 per cent. nosprasen, Horst dust [ibid., vi, p. 393], and 1 and 2 per cent. perosan (Chinoin, Ujpest).

CURZI (M.). **Rassegna fitopatologica e operosità nell'anno 1926 della R. Stazione di Botanica Crittogamica (Laboratorio Crittogamico) in Pavia.** [Phytopathological report and activities for the year 1926 of the Royal Station of Cryptogamic Botany (Cryptogamic Laboratory) in Pavia.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. III, iv, pp. xlv–lxiv, 1927.

Most of the information contained in the present official report to the Italian Ministry of National Economy on the work done in 1926 at the Cryptogamic Laboratory in Pavia has already been noticed in various issues of this *Review*. Of interest is the statement that the author was able to find *Helminthosporium sativum* parasitizing wheat only in one experimental plot at the Station, after the flowering stage. In the infected area the wheat was partly lodged, the stems bending over at the nodes at more or less wide angles, and the infection being always situated on the convex side of the bend. The disease was localized to small patches in the plot, where the soil was rich in organic substances, rather moist, and shady. The fungus is not considered dangerous under the conditions generally prevailing in Italy.

Numerous cases were reported of fruit tree plantations having been severely damaged by the improper use of calcium cyanamide

as manure, the mortality of the young trees being sometimes as high as 70 or even 90 per cent.

A list is given of the principal plant diseases observed at or reported to the Laboratory during the year. *Rosellinia necatrix* was determined on roots of apples, *Genista monosperma*, roses and acacias; *Pseudoperonospora humuli* on hops; *Fusicoccum amygdali* on almonds; and *Aureobasidium vitis* on vines, besides many other common parasites of cultivated plants.

Augu Aizsardzibas Instituta darbibas parskats par laiku no 1. maija 1925 g. lidz 1. maijam 1926 gada. [Survey of the activities of the Plant Protection Institute for the year from 1st May 1925 to 1st May 1926.]—*Latvijas Lauksaimniecibas Centralbiedribas Parbibas Parskata par laiku no 1. maija 1925 g. lidz 1. maijam 1926 gada* [*Report on the activities of the Latvian Central Agricultural Society for the year from 1st May 1925 to 1st May 1926*], Riga, pp. 41–83, 13 figs., 1926.

In this report details are given of experiments in the prevention of potato blight (*Phytophthora infestans*) carried out during 1924 and 1925, and also in seed disinfection tests against *Fusarium nivale* [*Calonectria graminicola*] and *Urocystis occulta* on rye and *Tilletia tritici* on wheat.

A list of fungi (chiefly parasitic) observed in Latvia during 1925 is appended.

Part IV. Entomology and Mycology.—*Proc. S. and E. African Agric., Cotton, Entom., and Mycol. Conf. Nairobi, 1926*, pp. 169–242, 1926.

In a statement regarding the methods employed in Kenya in controlling coffee leaf disease (*Hemileia vastatrix*), MacDonald emphasized the importance of maintaining the general health of the plant by proper regulation of ventilation and shade, by manuring, and by avoiding strain induced by overbearing. Owing to the difficulty of procuring quicklime in Kenya, spraying with carbide mixture (2 lb. copper sulphate, 12 oz. calcium carbide, 40 galls. water) has been adopted with success [*R.A.M.*, i, p. 51], and is carried out first before the advent of the main rainy season and then about two months later. It was stated that in Tanganyika, spraying with Bordeaux or carbide appeared ineffectual, and many planters have given it up, relying rather on the maintenance of natural plant vigour to resist the disease. Die-back in coffee is stated to be the result of excessive strain and not due directly to parasitic agencies. The main cause in Kenya is overbearing, but indirect causes are severe attacks of leaf disease or thrips, both of which produce defoliation. Other contributory factors may be insufficient rainfall, neglect of proper cultivation, and the like. Two cases in six years' experience are mentioned in which *Colletotrichum coffeanum* [*Glomerella cingulata*], usually harmlessly saprophytic on coffee, had become actively parasitic and caused death to branches. Black tip [ibid., v, p. 299], occurring above 6,000 ft.

and due to too rapid temperature changes, is not to be confused with die-back.

A disease of coco-nuts characterized by excessive nut fall is stated by Miss Welsford to be very prevalent in Zanzibar. A reduction of the crop is brought about by abortion of the flowers, dropping of immature nuts, and the non-development of the inflorescences. Associated with this nut fall is a gummosis and deformity of the nuts, with the formation of lesions in the husks. No evidence of parasitic fungi was found on examination of the lesions, peduncles, stems, margins of stem cracks, or roots, and it is concluded that the disease is not due to fungous attack. The abortion of the female flowers was found to be caused by the failure of fertilization due to insufficient nourishment of the pollen grains, and the failure of the micropylar canal to enlarge; both phenomena resulting from lack of moisture in the tissues. Attention was therefore directed to the possibility of malnutrition as a cause of the disease. Evidence was obtained that the condition of aeration of the soil may be an important contributory factor in the disease. Manuring experiments have been started to ascertain if the condition is due, in part at least, to lack of sufficient nitrogen, phosphorus, or potash in the soil. The results of these experiments are not yet available.

For the control of streak disease of maize in South Africa, Storey stated that the destruction of all overwintering volunteer maize plants is to be recommended, since they harbour the insect vector, *Balclutha mbila*. Early spring planting before the main crop is to be avoided. Trials have failed to show any marked resistance of standard varieties to the disease. The P. O. J. Chunee-Cheribon crosses and D. 1135 have proved immune from streak disease of sugar-cane under local conditions, while about 30 per cent. of the Uba cane is affected.

In a paper by MacDonald various problems connected with the incidence of plant disease in Kenya are discussed. The influence of general climatic conditions is shown in connexion with two major fungous diseases of coffee, leaf disease and coffee berry disease [*G. cingulata*], while the effects of localized conditions are marked in the case of pink disease [*Corticium salmonicolor*]. Further, the physiological disease known as 'black tip' is shown to be solely a result of climatic conditions, and the beneficial effect of the introduction of light shade is noted. Another example of the effect of climate on the distribution of disease is the limitation of yellow rust of wheat (*Puccinia glumarum*) to districts above 7,000 ft. The habit, common in Kenya, of not rotating the crops is shown to have adverse effects in increasing the range of plant diseases, and in weakening the resistance of the crop, through the depletion of essential food materials in the soil. This is found in the cases of flax wilt [*Fusarium lini*], head smut of maize [*Sorosporium reilianum*], and other fungous diseases. Another factor operating towards the increase of disease is the practice of allowing overbearing (especially in coffee), resulting in a weakened condition of the plants. In streak disease of maize and sugar-cane, which has only recently been detected in Kenya, the disease appears to be limited to the red soil of the Kyambu and Fort Hall districts.

A recommendation as made during the course of the conference that each participating territory should prepare a list of the fungous diseases of plants found therein.

Field Crops—[*ex* **Progress of Agricultural Experiments—1926**]. —*Ann. Rept. New Hampshire Agric. Exper. Stat. for the year 1926* (*Bull.* 227), pp. 11–17, 1927.

Experiments were conducted by O. Butler to ascertain the effect of maturity of Green Mountain and Irish Cobbler seed potatoes on freedom from virus diseases and productivity of the plants raised from them. In the former variety the incidence of mosaic was lowest (0·30 per cent.) in plants from tubers dug after 124 days, and highest (7·35 per cent.) in those lifted after 90 days. Leaf roll was most prevalent (9·31 per cent.) after 90 days and least (2·10 per cent.) after 100. In the latter variety leaf roll was absent after 73 days and 90 days in two lots and present in another to the extent of 2·52 per cent. The highest incidence of leaf roll (32·69 and 10·70 per cent. in two separate lots) occurred in stock dug after 122 days.

A study was also made of the effect of temperature on mosaic, affected potatoes being planted in glazed pots and the water in the soil kept at 70 per cent. of saturation of the air-dry soil. The plants were divided into four series, (1), (2), and (3) being daily exposed to a temperature of 28° C. or above for four hours, two hours, and one hour, respectively, while (4) was kept at a temperature below 25°. Mosaic symptoms remained perfectly obvious throughout the experiment in the case of (4); the plants of (3) became normal as regards margin and smoothness of blade but remained faintly mottled; in (2) the symptoms were faint but recognizable; while in (1) there was no trace of mosaic. The highest yield (45·1 gm. tuber weight per plant) was given by series (1) and the lowest (36·06 gm.) by (4).

Further studies were made by O. Butler on the relative value of hand dusting and spraying for the control of potato diseases [*R.A.M.*, iv, p. 694]. The sprayer used was the Vermorel Eclair, and the dusters the Vermorel double-action Torpille and the Niagara blower. An 8–4–50 Bordeaux mixture was applied fortnightly with the sprayer, and Sanders dust (8·6 per cent. metallic copper) weekly and fortnightly with Niagara and weekly with Torpille. During August the plants in all the plots suffered severely from tipburn. The highest yield (279·8 bushels per acre) was given by the plot dusted weekly with the Niagara apparatus. The sprayed plot yielded 247·5 bushels per acre, compared with 222·6 for the control.

Plant Pathology—[*ex* **Progress of Agricultural Experiments—1926**].—*Ann. Rept. New Hampshire Agric. Exper. Stat. for the year 1926* (*Bull.* 227), pp. 35–36, 1927.

Experiments by O. Butler to determine the effect of increasing the percentages of lime in Bordeaux mixture on injury to sprayed fruit showed that, with 1 per cent. solutions in which the ratio of copper to lime was 1:0·2; 1: alkalinity; 1:1; 1:2; 1:4; and 1:6, apple fruit and leaves were uniformly damaged at all ratios up to

and including 1 : 2, the injury becoming negligible at and above 1 : 4. Peaches are more sensitive than apples, and a ratio of copper sulphate to lime of 1 : 6 was necessary to prevent all injury [*R.A.M.*, iii, p. 285; iv, pp. 675, 719].

It was found inadvisable to reduce the number of treatments against apple scab [*Venturia inaequalis*] from three to two, the incidence of infection in the plots sprayed only twice being above 2½ times as great as that in those receiving three applications of lime-sulphur 1 in 50 (13·78 compared with 5 per cent.). Better control was given by the use of 2–2–50 Bordeaux mixture for the pre-pink and pink sprays and lime-sulphur 1 in 50 for the calyx spray, or by four applications of 1 in 50 lime-sulphur, than by three treatments with 1 in 50 lime-sulphur.

REED (G. M.). **Plant Pathology.** *Sixteenth Ann. Rept. Brooklyn Bot. Gard., 1926* (*Brooklyn Bot. Gard. Record*, xvi, 2), pp. 37–45, 1 fig., 1927.

Continuing his experiments on varietal resistance to loose and covered smuts of oats (*Ustilago avenae* and *U. levis*) [*R.A.M.*, v, p. 484; vi, p. 156], the writer found that the varieties Black Diamond, Black Norway, Danish, Danish Island, Early Gothland, Green Russian, Irish Victor, Japan, Monarch Selection, Scottish Chief, Trisperma, and White Queen are highly susceptible to the former but almost or quite immune from the latter disease. On the other hand, Monarch proved very susceptible to covered smut but highly resistant to *U. avenae*. The cultivated oats derived from *Avena sterilis* have shown a high degree of resistance to both smuts. Some strains of *A. strigosa* are equally susceptible to both, while others possess a high degree of resistance. *A. brevis* is very resistant to loose smut but somewhat susceptible to *U. levis*, while *A. barbata* and *A. fatua* were found to be very susceptible to both.

Further studies have been carried out on the reaction to loose smut of crosses between the very resistant Black Mesdag and the susceptible Hull-less variety [ibid., v, p. 27]. In the four F_2 families investigated, the percentage of infection ranged from 19·1 to 25·8 per cent. The corresponding figures for infection of F_2 plants by covered smut were 12·2 to 26·5 per cent. In the F_2 generation of crosses between varieties susceptible to both smuts, all the plants proved to be susceptible. In a cross between Victor (susceptible to both smuts) and Early Gothland (susceptible to loose but resistant to covered smut) all the plants inoculated with *U. avenae* showed infection, while only 18·1 per cent. of those inoculated with *U. levis* became smutted.

Further evidence has been obtained that both *Tilletia tritici* and *T. levis* contain highly specialized strains distinguished by their capacity for infecting certain varieties [ibid., iv, p. 340]. Thus Martin, which is highly resistant to the usual collections of bunt, has proved quite susceptible to certain others.

The investigations on the inheritance of resistance to covered kernel smut of sorghum [*Sphacelotheca sorghi*] in certain crosses have been continued [ibid., v, p. 88]. A cross between the very resistant Feterita and the susceptible Sumac Sorgo seems to indi-

cate that susceptibility is dominant and resistance recessive. During the past year, 69·6 and 67·1 per cent. of the plants became infected in two crosses, as compared with 86·1 per cent. in the case of Sumac Sorgo and nil in that of Feterita. The F_3 families have shown great variations in the amount of smut, and the morphological characters of the two parents are variously combined with resistance or susceptibility. The results of a cross between Milo and Blackhull Kafir appears to denote that in this case resistance is dominant. During the past season, 17·1 per cent. of the F_2 plants became infected as compared with 47·7 per cent. of smut in Blackhull Kafir and none in White Milo. In the F_3 and F_4 generations various combinations of characters were found, several greatly resembling Blackhull Kafir but showing a high degree of resistance.

Many bearded varieties of iris were severely injured during the year by a disease involving the destruction of the fibrous roots. The plants generally recovered when the rhizomes were lifted, cleaned, and exposed to the sun for a few days, but this operation, while preserving the variety, is destructive to bloom during a particular season.

Informe Anual del Director Estac. Exper. Insul. Depart. Agric. y Trab. Puerto Rico, Año Fiscal 1925–1926, 62 pp., 1927.

This report contains, *inter alia*, the following references of phytopathological interest. Considerable attention has been paid to investigations on eye spot of sugar-cane (*Helminthosporium sacchari*) [*R.A.M.*, vi, p. 376], which causes heavy damage to a number of commercial varieties, e.g., D. 109, D. 433, and F.C. 306, a plot of the last-named having been completely destroyed by it at the Experiment Station.

Cane gummosis [*Bacterium vascularum*] continues to occur in a sporadic form and tests of varietal susceptibility and resistance to this disease are in progress.

The P.O.J. 2725 variety of sugar-cane has attracted much attention by its vigorous growth, good ratooning qualities, and virtual immunity from mosaic disease. There is a growing tendency to replace the mosaic-resistant Java and Kavangire (Uba or Japanese) canes, which were extensively used instead of B.H. 10 (12) and S.C. 12 (4) after the epidemic of 1919, by varieties richer in sucrose and less fibrous.

The cane varieties F.C. 306 and 214, P.R. 328, 449, 358, 329, and 728 suffered severely from root disease [ibid., vi, pp. 186, 378, 508] in recent field experiments. The B.H. 10 (12) variety was the only one showing resistance to this disease.

The Champadan variety of mango has been found to be very susceptible to anthracnose (*Gloeosporium mangiferae*) [*Glomerella cingulata*].

Experiments have shown that the *Phytophthora* disease of tobacco [? *P. nicotianae*: ibid., vi, p. 323] can be controlled by applications of Bordeaux mixture.

The heaviest damage to the Porto Rican banana crop is caused by *Fusarium cubense*, and the only known means of control is the exclusion of the disease from healthy areas. The resistant Bout

Rond variety, imported from St. Lucia, is making good progress and is to be propagated for distribution in the infected areas.

A severe attack on tomatoes and eggplants by *Bacillus solanacearum* occurred at the Station, and experiments are in progress to discover resistant varieties.

MAGROU (J.). **Remarques sur la bactériologie et l'anatomie du crown gall.** [Notes on the bacteriology and anatomy of crown gall.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 1, pp. 45–50, 1927.

The present paper is a somewhat expanded account of the results obtained by the author in his investigations of the anatomy of cancer of plants or crown gall (*Bacterium tumefaciens*), already noticed from another source [*R.A.M.*, vi, p. 149].

REHWALD (C.). **Ueber pflanzliche Tumoren als vermeintliche Wirkung chemischer Reizung.** [On plant tumours as the supposed effect of chemical stimulus.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxiv, 3–4, pp. 65–86, 9 figs., 1927.

In connexion with the investigations of Bittmann, Auler, and others on the formation of plant tumours by chemical stimulus [*R.A.M.*, iv, pp. 725, 726], the writer conducted a similar series of tests on slices of carrot and other plant tissues. The application of 0·5, 1, 2, or 4 per cent. lactic acid or of 1 per cent. butyric, propionic, tartaric, or formic acids, or copper oleate led to the formation in the cambium and adjacent tissues of globular, white, frequently coalescent protuberances, the histological structure of which did not differ in any essential respect from those induced by *Bacterium tumefaciens* [contamination by which is stated to have been rigorously excluded]. Similar growths developed on sections treated only with water or left untreated. They are regarded by the author as being callus outgrowths. It was observed that the neoplasms developed only at the root pole of each slice. Similar results were obtained on root slices of horse-radish, radish, turnip, *Scorzonera hispanica*, and *Taraxacum officinale*, the first-named being treated as described above and the remainder only with water or 1 per cent. lactic acid. Minute intumescences were also produced by the application of lactic acid to leaves of *Brassica sabauda* and seeds of broad beans (*Vicia faba*), peas, and oranges.

These investigations are regarded as showing that the development of tumours of the type described by the above-mentioned authors is not due to any specific action of organic acids, wounding alone being responsible.

BECHHOLD (H.) & SMITH (L.). **Das Tumefaciens-Plastin.** [The *tumefaciens* plastin.]—*Zeitschr. für Krebsforsch.*, xxv, 1, pp. 97–104, 3 figs., 1927.

Experiments conducted at the Frankfurt Institute for Colloidal Research showed that *Bacillus* [*Bacterium*] *tumefaciens* P.M. [*R.A.M.*, v, p. 83] is comparatively tolerant of changes in the reaction of the medium, growing through a range of P_H 5·4 to 8·2. Ultra-microscopic examination of the filtrate of *Bact. tumefaciens*

passed through a Chamberland L-5 filter and other special apparatus revealed no traces of organic contamination. The writers give the following reasons for their belief that this filtrate, which was capable of producing tumours on carrot slices, contains no living virus. (1) It passes ultra-filters which retain particles measuring 20 $\mu\mu$ in diameter and probably still smaller ones. (2) The active principle contained in the filtrate is resistant to boiling for twenty minutes and to one hour's exposure to 1 per cent. phenol. The active principle of *Bact. tumefaciens* would appear from these experiments to belong to the finely dispersed colloids of the hydrophile colloid type. It is termed *tumefaciens*-plastin.

SERBINOFF (I. L.). Материалы к систематическому обследованию 'бактериозов' сельско-хозяйственных растений в связи с массовым развитием грибов **Macrosporium Fr.** и **Alternaria Fr.** [Contribution to the systematic investigation of 'bacterioses' of agricultural plants in connexion with the epidemic development of *Macrosporium* Fr. and *Alternaria* Fr.]—*La Défense des Plantes*, Leningrad, iv, 1, pp. 78–84, 1927.

Careful field observations and laboratory investigations started in 1921 led the author to the conclusion that diseases of cultivated plants caused by species of *Macrosporium* and *Alternaria* in the neighbourhood of Odessa are not pure infections but are secondary to the previous attacks of different species of bacteria. Thus, *Macrosporium* (*Alternaria*) *solani* on potato leaves and *Fusarium solani* in potato tubers were always found in association with species of *Actinomyces, Bacterium, Micrococcus, Bacillus mesentericus vulgatus* Serb., *B. mesentericus fuscus* Serb., *Proteus nadsonii*, and *B. amylobacter*. Ring rot of tomatoes (*Alternaria tenuis* f. *jaczewskii* Baransky) is associated with *Bact.* (*Phytobacter*) *lycopersicum*, which is also always present in cases of leaf and fruit spots of eggplants associated with *Alternaria solani* f. *melongenae* Serb. A brown leaf spot of barley, which is very prevalent around Odessa, and is stated to be a hitherto undescribed disease, was found to be caused by an association including *Alternaria brassicae* f. *tritici* P. Brun., *Helminthosporium gramineum*, a species of *Micrococcus* closely related to *M. tritici*, and a species of *Bacterium*. A spotting and wet rot of onion stems is caused by *Macrosporium parasiticum* in association with *B. mesentericus*, *B. mesentericus fuscus*, and species of *Micrococcus* and *Bacterium*. *Macrosporium uvarum* was found associated with a leaf spot and an acid rot of grapes on vines attacked by *Plasmopara viticola* together with *Micrococcus acidovorax* and *M. staphylophagus*. In the author's opinion, all the fungi listed above are either facultative or weak parasites, the epidemic development of which in the region referred to is chiefly due to the almost ubiquitous presence of these bacterial forms in the soil. He also believes that bacteria play a considerable part in the production or absence of the hibernating forms of the fungi.

KIRBY (R. S.). **Diseases of small grains.**—*New York (Cornell) Agric. Exper. Stat. Exten. Bull.* 157, 71 pp., 31 figs., 1927.

In this pamphlet the commoner diseases of wheat, oats, barley,

and rye found in the United States and more especially in New York State, are described in a form which is designed to be of use to farmers. In connexion with each disease, the distribution in the States, varietal susceptibility, symptoms, cause, and control are treated, while many helpful illustrations are included. Of the wheat diseases, those dealt with include the smuts (*Tilletia levis*, *Ustilago tritici*, and *Urocystis tritici*); rusts (*Puccinia graminis* and *P. triticina*); scab or *Fusarium* blight (*Gibberella saubinetii*); take-all (*Ophiobolus cariceti*) [*O. graminis*]; *Helminthosporium* disease (*H. sativum*); anthracnose (*Colletotrichum graminicolum*); glume blotch (*Septoria nodorum*); speckled leaf blotch (*S. tritici*); powdery mildew (*Erysiphe graminis*); basal glume rot (*Bacterium atrofaciens*); and ergot (*Claviceps purpurea*). The diseases described in the cases of oats, barley, and rye include the common rusts and smuts of these crops, as well as scab, anthracnose, mildew, and ergot of all three; take-all and *H. sativum* on barley and rye; halo blight (*Bacterium coronafaciens*) of oats; and stripe disease (*Helminthosporium gramineum*), net blotch (*H. teres*), and bacterial blight (*Bacterium translucens*) of barley.

DUCOMET (V.). **Les rouilles du Blé au cours de la campagne 1925–1926.** [Wheat rusts during the season 1925–1926.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 1, pp. 39–44, 1927.

Observations made during the winter of 1925 at Grignon showed that in December and January, after cold periods, uredospores of *Puccinia glumarum* and *P. triticina* were present in a viable condition on the leaves of wheat plants that had been sown in the preceding spring, and of volunteer seedlings of *Triticum dicoccoides*. In January apparently healthy plants showed infection with the two rusts within five days of their removal to a hothouse, while plants that had been artificially infected at the same time displayed the first symptoms only after the tenth day, thus indicating that natural infection had taken place in the first case during that period in the fields [*R.A.M.*, v, p. 24]. On such plants the rusts started spreading to a considerable extent as early as the last week in May, whilst on normal autumn and spring crops the diseases began to do serious damage only after 5th July. *P. graminis* first appeared on 20th July, some ten days later than in the preceding year; the infection was slight and was only observed on five varieties, as against 25 in 1925.

The peculiar behaviour of the rusts during the season under review (earlier appearance than usual of *P. glumarum* and later of the other two) is attributed to the action of meteorological factors which at first accelerated and later delayed the development of the hosts. The indications are that *P. graminis* cannot withstand the rigour of the winter in the region. *P. triticina* thrives best in seasons when the temperature minima are above 10° and the maxima at about 25° C., and *P. glumarum* in seasons when the temperature does not fall below 6° and does not rise over 20°. It was also noted that fine rain favours the development of *P. glumarum*, but is not necessary for *P. triticina*, for which night dews are sufficient.

CURRAN (G. C.) & KOEHLER (B.). **Protection of grain crop demands Barberry eradication.**—*Illinois Agric. Exper. Stat. Circ.* 308, 12 pp., 1 col. pl., 5 figs., 1 map, 1926.

The losses in the Illinois wheat crop from 1919 to 1923 as the result of stem rust (*Puccinia graminis*) are estimated at over 2,000,000 bushels. Since the institution of the barberry (*Berberis vulgaris*) eradication campaign in 1918, 328,000 bushes have been destroyed, but the work will have to be carried on for a number of years in order to eliminate all sprouts and seedlings. Instances are cited of the spread of the rust from barberries to grain fields, and directions are given for the destruction of the bushes by the application of crushed rock salt at the rate of 10 to 15 lb. per bush [*R.A.M.*, vi, p. 283].

TOCHINAI (Y.) & KIHARA (H.). **Studies on the correlations between morphological characters, chromosome-number and resistance to Puccinia triticina in pentaploid-bastards of Wheat.**—*Journ. Hokkaido Coll. of Agric., Sapporo, Japan*, xvii, 3, pp. 133–161, 1 graph, 1927.

Previous investigations on the correlation between genetical characters and rust resistance in wheat have been conducted principally on *Puccinia graminis* and *P. glumarum* [*R.A.M.*, iii, p. 200; iv, p. 532]. In the Hokkaido district of Japan, however, the heaviest losses are caused by *P. triticina*, and therefore this fungus formed the chief part of the authors' studies.

Observations were made on the resistance of nine species of *Triticum* and three of *Aegilops* to *P. triticina* and *P. graminis* biologic form XXI. The species of *Triticum* belonging to the 21 haploid chromosome dinkel group (*T. vulgare, T. spelta*, and *T. compactum*) proved generally susceptible to both fungi, but the strain of *T. vulgare* used in the tests (Sapporo-Yu-bo) showed fewer uredosori on the leaves and stems than the other two species. As regards the 14 haploid chromosome emmer group, *T. durum* and *T. dicoccum* were highly resistant, while *T. turgidum*, *T. polonicum*, and the wild species, *T. dicoccoides*, showed a moderate degree of resistance to both rusts. The 7 haploid chromosome einkorn wheat, *T. monococcum*, was practically immune from both rusts. *Aegilops ovata*, *A. triticoides*, and *A. squarosa* were highly resistant to both.

F_1 hybrids of dinkel and emmer wheat were susceptible (those of *T. spelta* and *T. polonicum* highly so) both to *P. triticina* and *P. graminis*. F_1 hybrids of *T. durum* and *T. vulgare* (Sapporo-Yu-bo) were somewhat less susceptible to *P. triticina* and also more resistant to *P. graminis*. F_1 hybrids of *T. turgidum* and *T. compactum* were very susceptible to *P. triticina* and less so to *P. graminis*. These results are stated to agree closely with those reported by Vavilov (*Journ. of Genetics*, iv, p. 49, 1914).

The correlations between the morphological characters, chromosome numbers, and rust resistance in the F_1 to F_4 generations of the wheat hybrids are discussed and tabulated. In general, the segregates of *T. durum* and *T. vulgare* having 28 or 29 chromosomes in the diploid stage and *durum*-like morphological characters are resistant, and those resembling *T. vulgare* in chromosome

number (42 diploid) and morphological characters are susceptible to both rusts. The degree of resistance or susceptibility, however, fluctuates in different strains of these hybrids. The F_4 hybrids of *T. polonicum* and *T. spelta*, which generally resemble the latter in morphological characters and have 42 or nearly 42 chromosomes, were found to be unusually susceptible to *P. triticina*—far more so than the susceptible parent. The F_4 hybrids of *T. turgidum* and *T. compactum* resembling the latter in morphology and chromosome number are generally as susceptible to both rusts as the susceptible parent.

In crosses between emmer and dinkel wheats, the combination of the parent chromosomes conforms to certain rules. The F_1 hybrid has 35 (14 bivalent + 7 univalent) chromosomes, and in succeeding generations, the chromosome number of the descendants increasing to 42 or decreasing to 28, the chromosome combination becomes homozygous when the numbers coincide with those of the parents, i. e., 42 or 28. The chromosome number increases slowly and decreases rapidly in advancing generations of the hybrids. These fluctuations result from the loss or duplication of seven chromosomes which were univalent in F_1 plants. Rust resistance in wheat seems to be one of the characters weakened by the presence of genes existing in these seven chromosomes. It is therefore improbable that a rust-resistant strain with otherwise desirable characters will be obtained by the crossing of emmer and dinkel wheats. Successful results are more likely to be achieved by selection and hybridization among comparatively resistant strains of *T. vulgare*.

A bibliography of 33 titles is appended.

SAMPSON (KATHLEEN). **The relative resistance of Wheat varieties to bunt (Tilletia tritici).**—*Welsh Journ. of Agric.*, iii, pp. 180–196, 1927.

From 1924 to 1926 the writer studied the susceptibility to bunt (*Tilletia tritici*) of a number of British and foreign varieties of wheat. None of the forty pure line selections of Hen Gymro showed outstanding resistance, and no correlation was found between morphological characters and relative susceptibility. Of 65 samples, including 32 British varieties, tested in one season for bunt resistance, all showed relatively high susceptibility (56 to 91 per cent.). Squarehead's Master, Benefactor, Little Joss, Standard Red, and Svalof Iron gave comparatively low figures. Fortuna showed 91 per cent. bunt, while 19 of the winter-sown wheats showed over 80 per cent. infection. Two American varieties, Martin and Hussar, which are immune in the United States [*R.A.M.*, iv, p. 405], also appear to be completely resistant to bunt in Wales. The highly resistant American varieties, White Odessa, Turkey, and Ridit [loc. cit.], also gave promising results in the Welsh trials. Heils Dickkopf (Squarehead), which has shown resistance to bunt in Germany [ibid., iii, p. 205], was comparatively resistant in Wales. This variety, together with Florence and Pommersche, developed 33 to 45 per cent. of healthy grains in infected heads. In most of the varieties investigated the invasion of the infected ears was usually complete.

The results of these experiments [which are tabulated and discussed] indicate that the necessary improvement of British wheats in regard to bunt resistance may be effected by hybridization with the immune varieties Hussar and Martin.

The behaviour in Wales of certain foreign varieties of known bunt resistance does not support the view [see above, p. 535] that *T. tritici* is a fungus comprising a number of biologic species.

SIELING (M. K.). О частичной пораженности зерен Пшеницы мокрой головней. [On the partial infection of Wheat grains with bunt.]—Reprinted from *Morbi Plantarum*, Leningrad, xv, 3, 8 pp., 1 fig., 1926. [Received 1927.]

An investigation of bunted [*Tilletia tritici*] wheat from the experimental fields of the Siberian Agricultural Academy at Omsk showed that partly infected ears contain, besides normal and entirely bunted grains, about 5 per cent. of partly infected grains. The latter differ from the normal by their darker colour, smaller size, and wrinkled surface. Cross-sections showed the presence in such grains of layers of spores, varying in shape and thickness and usually located between the integument and the layer of chlorophylliferous cells. The spores inside the grains frequently lacked their characteristic warts and were of a lighter colour, thus somewhat resembling those of *T. levis*, but they were as viable and as capable of producing conidia as those from entirely bunted grains, although their germination was somewhat delayed. The majority of the partly bunted wheat grains were able to germinate, but frequently, especially in *Triticum vulgare* var. *milturum*, the germs were deformed and emerged through the dorsal part of the grain.

BUDDIN (W.). **Experiments in the control of bunt (Tilletia tritici) in Wheat, carried out at the University Farm in 1924, 1925 and 1926.**—*Univ. of Reading, Guide to the Univ. Farm and Exper. Stat., 1927*, pp. 42–44, 1927.

The most consistently successful results in the control of wheat bunt (*Tilletia tritici*) in the Martin variety during the period 1924 to 1926 were given by the liquid copper sulphate treatment (3 lb. per 4 galls. water, applied at the rate of 1 gall. to 4 bushels), which reduced the incidence of infection from 41, 72, and 29·7 per cent. to 1·4, 6·1, and 0·35 per cent., respectively. For the badly contaminated seed-grain employed in these tests it was necessary to use formaldehyde at a strength of 1 in 320 to obtain complete control, but for average samples the 1 in 480 concentration (1 gall. to 2 bushels) is adequate. Copper carbonate dust (3 oz. per bushel) is stated to be effective against bunt in cases of moderate infection, but it has been found inferior to copper sulphate against severe contamination. Liquid germisan (0·5 per cent.), tutan dust, and porzol dust (3 oz. per bushel) appear to be the most promising of the organic mercury compounds which are largely used on the Continent, but these preparations have been found in no way superior to copper carbonate or the wet treatments, and their toxicity is a decided drawback. A table is given showing the results of the various treatments.

LIMBOURN (E. J.) & THROSSELL (G. L.). **Copper powders for the prevention of bunt in Wheat.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 1, pp. 92–97, 1927.

Experiments to test the efficacy of various copper powders for the control of ball smut [*Tilletia tritici* and *T. levis*] of wheat were continued in 1926 at the Chapman and Merredin Experiment Farms on the same lines as in previous years [*R.A.M.*, v, p. 661], with the exception that the rate of infection of the seed with bunt spores (*T. levis* was used) was increased twenty-fold, as it was believed that the previous tests had not been severe enough. The same preparations as in 1925 were tested, as well as a new one, 'vitrioline', containing 16·63 per cent. of total acid-soluble copper (copper sulphate with a small proportion of copper acetate). The results confirmed the stimulating effect of all the preparations, with the exception of copper acetate, on the germination and early growth of the seedlings. They proved unsatisfactory, however, for the control of bunt when the seed was blackened with spores, and in a season such as 1926, when soil and meteorological conditions were favourable to the disease.

Several of the plots were attacked by *Pleosphaeria semeniperda* [ibid., iv, p. 151], which was not previously known to occur in Western Australia. The disease was absent from plots in which the seed had been treated with copper carbonate, apparently as a result of the fungicidal properties of this compound.

STENING (H. C.). **Championship field Wheat competitions. Central south-west area.**—*Agric. Gaz. of New South Wales*, xxxviii, 2, pp. 101–107, 1927.

Details are given of the points of the crops submitted for inspection in connexion with a recent championship field wheat competition in the central south-west area of New South Wales. On the whole, the crops were fairly free from disease, bunt [*Tilletia tritici* and *T. levis*] having been almost entirely eliminated by dusting with copper carbonate. Blight (*Septoria tritici*) occurred in two of the crops. This disease, which causes the collapse of the straw and the production of pinched grain in discoloured ears, is favoured by cold, wet conditions. The use of resistant varieties, a good stubble burn, and light sowings on well fallowed land are recommended as control measures.

RIEHM (E.). **Ergebnisse der von Mitgliedern des Deutschen Pflanzenschutzdienstes in den Jahren 1919 bis 1924 ausgeführten Reichsbeizversuche.** [Results of the State disinfection experiments carried out during the period 1919 to 1924 by members of the German Plant Protection Service.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.* 31, 33 pp., 1927.

In this paper the author presents a concise summary, accompanied by tables, of the results obtained from 1919 to 1924 by members of the Plant Protection Service in different parts of Germany in their experiments on the control of wheat bunt (*Tilletia*) [*T. tritici* and *T. levis*], stripe disease of barley (*Pleospora gramínea*), loose smut of oats [*Ustilago avenae*], and snow mould of rye (*Fusarium*) [*Calonectria graminicola*].

BEHLEN (W.). **Eine Untersuchung des Wirkungswertes verschiedener Nass- und Trockenbeizmittel.** [An investigation of the efficacy of various liquid and dry disinfectants.]—*Schles. Zeit.*, 476, 3rd October, 1926. [Reprinted in *Nachricht. über Schädlingsbekämpf.*, ii, 1, pp. 10–12, 1927.]

In 1925 the writer tested a number of fungicidal steeps and dusts for the control of bunt [*Tilletia tritici* and *T. levis*] on artificially infected Original Criewener wheat seed-grain. Tillantin (liquid) and uspulun and höchst dust proved absolutely reliable, completely eliminating infection (which amounted to 25 per cent. in the untreated controls) and producing very satisfactory stands. Almost equally good control was effected by U 195 *a* and uspulun (liquid). All the above (of which tillantin and höchst have been found most economical) are supplied by the I. G. Farbenindustrie A. G. Porzol failed to give adequate control. Höchst dust was extensively used with excellent results in 1925–6 for the control of wheat bunt, stripe disease of barley [*Helminthosporium gramineum*], and loose smut of oats [*Ustilago avenae*].

CARNE (W. M.) & LIMBOURN (E. J.). **Flag smut of Wheat. Varietal resistance test.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 1, pp. 4–7, 1927.

Flag smut [*Urocystis tritici*] of wheat, which was first recorded in Western Australia in 1921, is stated to be so far of comparatively small economic importance in that State, the losses due to it not exceeding 0·25 per cent. of the total annual harvest. In view, however, of the possibility of its spreading, as in other Australian States, the recommendation is made that, in future, resistance to flag smut be included in wheat breeding tests for resistance to ball smut [*Tilletia tritici* and *T. levis*]. Experiments made in 1926 at the Merredin Experimental Farm confirmed field observations made since 1922 as to the susceptibility to the disease of the Gluyas Early and Merredin varieties, and the resistance of Nabawa and Yandilla King. There was evidence that the Nabawa and Bunyip varieties may be useful parents in the breeding of resistant wheats, and that Carrabin, Yandilla King, and Queen Fan may also be worth testing from this point of view.

LINDFORS (T.). **Betningsmedel för vårsäden.** [Disinfectants for spring seed-grain.]—*Landtmannen*, x, 10, pp. 182–183, 5 figs., 1927.

The writer has conducted a further series of tests on the comparative efficacy of various fungicides in the treatment of cereal diseases in Sweden [*R.A.M.*, v, p. 411]. Excellent control of loose and covered smut of oats [*Ustilago avenae* and *U. levis*] was given by 15 minutes' immersion in formalin (0·25 l. per 100 l. of water for the 40 per cent. solution, and 0·3 l. per 100 l. for the 36 per cent.). Havrefusariol [loc. cit.] absolutely eliminated infection by smut and *Fusarium* [*Calonectria graminicola*] and greatly increased the yield in 5 out of 7 cases. Half an hour's immersion in 0·25 per cent. germisan was also effective, though not quite equal to havrefusariol. Sprinkling with germisan was found to be unreliable. Good results were also obtained from uspulun II, for-

merly known as tillantin, used at the rate of 0·25 per cent. for half an hour's immersion. The most satisfactory of the dusts tested was abavit B (500 gm. per kg.), tutan being uncertain in its action and uspulun and tillantin dusts of no value in the control of loose smut.

Good control of stripe disease, covered smut, and *Fusarium* of barley [*Helminthosporium gramineum*, *U. hordei*, and *C. graminicola*] was obtained with germisan and uspulun II, used as above, and with the original uspulun (one hour's immersion at 0·25 per cent.), the last-named, however, being slightly less efficacious against stripe disease. Havrefusariol and vetefusariol proved ineffective. Abavit B and tutan dusts controlled stripe disease and *C. graminicola* satisfactorily. Uspulun dust was unreliable against stripe disease and tillantin dust useless.

The treatment of autumn wheat and rye seed-grain has already been discussed [ibid., vi, p. 25], and the preparations then recommended are suitable also for spring varieties. Abavit B (300 gm. per 100 kg. of seed-grain) has since been tested with satisfactory results.

Agfa solution and agfa dust No. 33 (not yet on sale in Sweden) have also given good control of the above-mentioned diseases, with the exception of the smuts of oats, which are not generally amenable to dusting.

MILLARD (W. A.) & BURGESS (R.). **Blindness in Barley.** *Univ. of Leeds and Yorkshire Council for Agric. Education, Pamphlet* 151, 19 pp., 1 fig., 1927.

The condition known as blindness in barley is of two kinds. Stripe blindness, caused by the fungus *Helminthosporium gramineum*, is characterized by the discoloration of the affected ears due to the black clusters of spores. True blindness, physiological blindness, or 'gapping' is, however, much more frequent and is recognized soon after the emergence of the ear from the sheath by the transparent appearance of the affected spikelets. Later, the glumes become bleached, and the empty spikelets stand rigidly against the axis of the ear. No discoloration occurs and the unaffected spikelets produce perfectly healthy grains.

From the authors' observations the conclusion is reached that thrips are an important factor in the cause of this last type of blindness. These insects were found in 92·6 per cent. of the blind spikelets examined. It was also noticed that in certain varieties, e.g., Plumage, the glumes, shortly after emergence from the ears, gape slightly open, and thus an entrance is provided for the destruction of the ovary. The gaping of the glumes is an inherent transmissible character of the barley plant.

Certain varieties were found to be much more susceptible to blindness than others: Standwell and Plumage are so susceptible as to make their economic value doubtful. Brewer's Favourite and Golden Pheasant are less susceptible, while Spratt Archer, Plumage Archer, Archer Goldthorpe, Binder, Primus, and Gold appear to be highly resistant.

The failure, for some unknown reason, of the act of pollination, was found to be a contributory cause of the disease in 1926. This,

however, would only account for a very small percentage of the total blindness.

DAVIES (D. W.) & JONES (E. T.). **Further studies on the inheritance of resistance to crown rust (P. coronata, Corda) in F_3 segregates of a cross between Red Rustproof (A. sterilis L.) and Scotch Potato Oats (A. sativa).**—*Welsh Journ. of Agric.*, iii, pp. 232–235, 1927.

In continuation of their previous investigations [*R.A.M.*, v, p. 418], the writers inoculated F_3 seedlings of a cross between Red Rustproof (*Avena sterilis*) and Scotch Potato Oats (*A. sativa*) with uredospores of crown rust (*Puccinia coronata*) [*P. lolii*].

All the 83 seedlings from six susceptible F_2 plants exhibited complete susceptibility, thereby supporting the conclusion reached from the reaction of the F_2 segregates that susceptibility to crown rust in this particular cross behaves as a simple recessive. Ten of the 29 resistant F_3 families inoculated showed complete resistance, and 19 segregated into resistant and susceptible types in a manner identical with that obtained in the F_2 generation. The true-breeding resistant and segregating families are in the ratio 1 : 1·9, agreeing closely with the 1 : 2 ratio to be expected from a monohybrid interpretation of the results.

The true-breeding character of the susceptible families, which formed 25 per cent. of the F_2 generation plants, together with the total figures for the 19 segregating F_3 families, are evidence of simple segregation. The agreement of 172 resistant to 73 susceptible with the 'expected' 183·75 : 61·25 is only moderately close, but, with two exceptions, the proportions of resistant to susceptible in the F_3 segregating families show marked regularity.

It was found impossible to distinguish between the homozygous and heterozygous resistant forms in the F_2 generation owing to the paucity of phenotypes [loc. cit.], and therefore a minimum of about thirty seedlings of each F_3 family must be tested in order to determine the true-breeding resistant forms. This extremely laborious procedure has been found to be the only satisfactory means of isolating true-breeding resistant types in the early hybrid generations.

Some evidence was obtained during the studies of the existence of a certain degree of linkage between various undesirable grain characters and resistance to crown rust. Such an association would greatly complicate the work of selection and might even preclude the possibility of breeding rust-resistant types equal in quality to the best varieties of *A. sativa*. Further investigations on this highly important point are in progress with F_3 material.

BENIGNI (EMMA). **Note sull' Ustilago maydis (DC.) Corda nella Valle Padana.** [Notes on *Ustilago maydis* (DC.) Corda in the Padana Valley.]—*Riv. Pat. Veg.*, xvii, 3–4, pp. 57–72, 1927.

The widespread occurrence of maize smut (*Ustilago maydis*) [*U. zeae*] in the northern provinces of Italy has led the author to undertake a study of the disease.

In 82 collections from various parts of Italy in 1925 no signifi-

cant differences were observed in the morphology of the fungus. In germination tests spores of the current year germinated almost immediately, those a year old also germinated well, but no germination was obtained after three years. The optimum temperature for germination was from 25° to 30° C. (maximum 35°, minimum 15°). Infection from the soil was not found to be common, but inoculations by spraying spore suspensions over the terminal bud gave positive results. A relationship was observed between the attacks of the insect *Pirausta nubilalis* and smut infections.

In tests of varietal resistance a number of Italian varieties were found to be more or less immune from artificial infection, though further tests over a number of seasons are considered to be necessary to confirm these results.

Seedlings grown in water or culture solutions in which smut spores had been macerated or germinated were found to have their sap rendered unsuitable for the germination of the spores, whereas the sap of the controls, grown in well water, promoted spore germination. This apparently immunizing effect of the spore culture liquids passed off after a short period.

NISIKADO (Y.). **Temperature relations to the growth of graminicolous species of Helminthosporium: I. Effect of temperature on the vegetative and reproductive growth of Helminthosporium turcicum Passer. and Helminthosporium maydis Nisikado et Miyake.**—*Ber. Ōhara Inst. Landw. Forsch.*, iii, 3, pp. 349–377, 4 pl., 10 graphs, 1927.

In this paper, which forms part of a study on the temperature relations of the graminicolous species of *Helminthosporium*, the author discusses and tabulates the effect of atmospheric variations on the vegetative and reproductive development of *H. turcicum* and *H. maydis* (the conidial stage of *Ophiobolus heterostrophus*) [*R.A.M.*, vi, p. 157].

The mycelial growth of *H. turcicum* started between 5° and 8° C. and ceased between 33° and 35°, with an optimum at 27° to 30°. The minimum temperature for the mycelial growth of *H. maydis* was about 10°, the maximum 35°, and the optimum 30°. The aerial mycelium of both species developed best at 23° and 27°.

The colonies of *H. turcicum* were dark ivy-green at moderate temperatures and assumed an orange coloration towards the maximum. *H. maydis* was somewhat darker than *H. turcicum*.

Conidial formation was most profuse in both species at about 23°, the maximum and minimum temperatures being 30° and 11° for *H. turcicum* and 33° and 15° for *H. maydis*. The perithecia of *Ophiobolus heterostrophus* developed between 23° and 30°, with an optimum at 27°.

The conidia of *H. turcicum* were fusiform at the lower temperatures, becoming slender as the temperature rose, and exhibiting irregularities at 30°. Those of *H. maydis* were straight and cylindrical at 15°, fusiform or lunate at 23° to 30°, and very irregular at 33°. In *H. turcicum* the maximum dimensions of the conidia were attained at 15° ($105{\cdot}09 \pm 0{\cdot}45$ by $18{\cdot}83 \pm 0{\cdot}07\ \mu$), followed by a gradual decrease up to 30°, at which point the average size was only $75{\cdot}78 \pm 0{\cdot}68$ by $15{\cdot}65 \pm 0{\cdot}07\ \mu$. The conidia of *H. maydis*, on the

other hand, were very small at 11° and 15° (57·81 ± 0·38 by 13·13 ± 0·06 μ), increasing in size with the rise of temperature up to 19° (75·77 ± 0·57 by 14·61 ± 0·05 μ), and showing little divergence at 30° (71·39 ± 0·60 by 12·79 ± 0·06 μ). At the maximum temperature of 33° the average conidial dimensions of *H. maydis* were only 47·71 ± 0·61 by 9·72 ± 0·09 μ.

The average number of septa in the conidia of *H. turcicum* was 4·06 ± 0·05 at 11° and 6·27 ± 0·04 at 15°, the latter being the maximum number of septa for this species. At 30° the septa averaged only 3·94 ± 0·04. The corresponding figures for *H. maydis* were 4·37 ± 0·06 at 11°, increasing to 7·65 ± 0·05 at 19° and falling to 4·62 ± 0·08 at 33°.

The results of inoculation experiments showed that the leaf spot of maize caused by *O. heterostrophus* was most severe at 30°, while the optimum temperature for the occurrence of the leaf blight due to *H. turcicum* was somewhat lower.

The thermal death-points for both species were similar, namely, 54° for five minutes' exposure, 52° for ten minutes', and 50° for fifteen minutes'. At 48° a period of thirty minutes or longer was required to destroy the conidia.

REED (G. M.), SWABEY (MARJORIE), & KOLK (LAURA A.). **Experimental studies on head smut of Corn and Sorghum.**—*Bull. Torrey Bot. Club*, liv, 4, pp. 295–310, 5 pl., 1927.

A brief account is given of experiments carried out by the authors in the period from 1924 to 1926 for the purpose of establishing whether there exist any biological differences between the head smut of maize and that of sorghum, both of which are caused by the same species, *Sorosporium reilianum*. On sorghum the smut was first recorded in the United States in 1890; it is not particularly common there, but in the Panhandle region of Texas it is recognized to be of considerable economic importance. On maize, in the United States, it is stated to be practically unknown to the east of the Great Plains, including the Corn Belt, but recently its wide distribution has been noted in the State of Washington.

Briefly summarized, the results of cross-inoculation experiments indicated that the smut may to some extent pass from maize to sorghum and vice versa. Maize appeared to be much more readily infected than sorghum with its own smut, since quite high percentages of infection were obtained over a comparatively wide range of conditions with maize, while with sorghum the percentages of infection were very low when spores from maize were used and high when they came from sorghum. In the authors' opinion, these results indicate that the two smuts are distinct in their physiologic capacity for infecting these hosts, although they are not sharply limited to either of them.

WINSTON (J. R.), BOWMAN (J. R.), & BACH (W. J.). **Citrus melanose and its control.**—*U.S. Dept. of Agric. Bull.* 1474, 63 pp., 10 pl., 16 graphs, 1 map, 1927.

The bulletin contains a full account of the citrus melanose caused by *Phomopsis citri*, the perfect stage of which has recently been found to be *Diaporthe citri* [*R.A.M.*, vi, p. 159]. Melanose attacks a wide

range of Rutaceous plants, including all forms of citrus grown commercially in Florida. Of these the kumquats (*Fortunella* spp.) are perhaps the most susceptible; lemons (*Citrus limonia*), sour oranges (*C. aurantium*), limes (*C. aurantifolia*), and grapefruit (*C. grandis*) are very susceptible; and sweet oranges (*C. sinensis*) and kid-glove oranges (*C. nobilis*) slightly less so. The disease seems to be confined to North and South America and the West Indies, while in the United States it is most serious in Central Florida, where it is of considerable economic importance.

P. citri sporulates in nature only in the dead bark of twigs and branches; it has never been observed in or cultured from melanose lesions on mature naturally infected living parts, though it produces spores on immature artificially infected fruits and on those rotted from the stem-end rot disease produced by the same fungus. Spore production, germination, infection, and incubation are markedly retarded by temperatures outside the optimum range of 20° to 27° C. Infection may take place at any time of the year when rainy periods occur while growing parts are in a susceptible stage. Leaves of the orange and grapefruit are susceptible from the time they emerge from the bud until about two or three weeks later. The fruits are at first very susceptible, becoming progressively resistant with increasing age. Oranges develop practical immunity when about 1½ inches in diameter, and grapefruits when about 2½ inches. Under Florida conditions, therefore, oranges and grapefruits from the February or March bloom become practically immune in May, very few remaining susceptible after 10th June.

The causal organism seems to be principally disseminated by dew drip, rain drip, or rain spatter from the dead parts of the tree, but burning the dead and weakened parts to remove this source of infection has not proved a dependable means of control under ordinary commercial conditions. Severe pruning or deheading, such as is practised after damaging frosts, usually gives good control, provided that it is done before the May rains set in.

Dusting with sulphur preparations, Bordeaux dust, or copper-lime dusts has not given satisfactory control, nor have sulphur sprays or the weaker copper sprays (such as 1-1-50 Bordeaux). A single application of the standard 3-3-50 Bordeaux mixture plus 1 per cent. oil emulsion, if applied just in advance of the May rains, i. e., before 5th May, generally speaking, gives excellent control even under adverse conditions. If spraying is delayed until after these rains have continued for some time, it will be ineffective. Sprays applied before the blossoms open may reduce the fruit infection somewhat, but those applied in early April give better protection to the fruit and in late April or early May are better still. Such spring spraying with Bordeaux-oil emulsion should always be followed about a month later by a thorough application of oil emulsion of high efficiency to prevent excessive increases in scale insects, owing to the action of the Bordeaux mixture in reducing the entomogenous fungi that hold these in check.

SAHASRABUDDHA (D. L.). **A remedy for a die-back disease of Orange trees.**—*Agric. Journ. of India*, xxii, 2, pp. 114–117, 2 pl., 1927.

A die-back disease of orange trees has been reported from the

Ahmednagar District of Bombay Presidency and is attributed by the author to the sticky nature of the soil, which prevents proper aeration. Trees growing on loam were not affected. Experiments conducted at Deolali in this district to control the disease by means of increased aeration have given good results. The affected area was trenched, the bottom of the trenches being filled with broken tiles and stones, over which the soil, mixed with manure, was replaced. At the same time all dead branches were removed. All the trenched area showed a marked improvement after ten months, the degree of improvement corresponding to the number of trenches, being greatest when each tree had a trench on three sides. The cost of this treatment is estimated at about Rs. 1·8 [2*s.* 3*d.*] per tree.

BOTTINI (E.). **Sulla conservazione delle frutta. Ricerche sperimentali eseguite sulle Arancie.** [On the preservation of fruit. Experimental studies conducted on Oranges.]—*Ann. Chim. Appl.*, xvii, 3, pp. 129–163, 1 diag., 1927.

The results of extensive experiments carried out at the Turin Chemico-Agricultural Station showed that oranges keep best when stored in crates or small barrels in the presence of ammonium carbonate or trioxymethylene or, preferably, a mixture of both. The retardation of the evaporation of water from the fruit, effected by the formation of pectic acid with consequent hardening of the superficial parts, results in a drier atmosphere around the fruit and hence acts unfavourably on the development of micro-organisms. The liberation of methyl alcohol and its subsequent oxidation to aldehyde and formic acid also exercise a preservative effect.

SAWHNEY (A.). **Studies in the biological and cultural characters of Capnodium sp. on Cotton.**—*Journ. Indian. Bot. Soc.*, v, 4, pp. 141–186, 8 pl., 5 graphs, 1927.

This paper gives a detailed account of a species of *Capnodium* which in 1925 was found to cause brown specks on the under side of leaves and on the bolls of Sea Island, American, and Indian local (Desi) varieties of cotton grown in the Botanical Gardens of Lahore. On both organs the infection appeared to have originated in the nectar glands which, in the bolls, are placed at the base of the calyx tube within the bracteoles and alternating with the latter. On the leaves the infection is stated usually to start on the midrib, which is the first to develop a gland; later, the fungus spreads along the midrib from the gland, forming a long strip, and then to the neighbouring veins. The bolls are infected when they are well on their way to maturity. It is thought probable that the fungus finds a suitable nutrient medium for growth in the sugary exudation of the glands. Artificial inoculation experiments showed that other parts of the plant, e.g., the stem and petioles, were capable of being infected with the fungus through wounds, when the inoculated parts were kept moist for some days; on parts of the stem left uncovered the inoculations failed.

Histological investigation showed that the hyphae of the fungus come into close contact with the host only in the region of the glands; outside this region they form a sort of felting over the

plant parts. The uppermost cells of the gland are the first to be attacked: the cytoplasm collects towards the centre of the cell in a grumous mass, which turns brown, probably owing to the oxidation of substances, such as tannin, in the cells, and breaks up into amorphous granules. This process gradually extends to the lower cells, until finally nothing remains of the gland but a cavity with no walls, no protoplasmic contents, and only a number of dark, refractive globules scattered here and there. In severe cases the fungus was found to spread also to the neighbouring parts of the leaf, gradually killing the cells and in some places even penetrating the host tissue to a considerable distance towards the vascular bundle.

In nature the mycelium forms a jet-black patch and consists of branching, septate, anastomosing hyphae, from 4·8 to 8·1 μ thick, which appear dark brown under the microscope. They are composed of mostly uninucleate, irregular cells, from 10·7 to 18·5 μ long and constricted at the septa. Of the various types of fructification produced, the most abundant in nature are the pycnidial and the *Torula* stages; the *Coniothecium* stage was found but rarely, and the *Brachysporium* and *Triposporium* stages were not observed in nature, though the latter was once seen in a culture and consisted of spores composed of four radiating arms borne on a one- or two-celled stalk. The pycnidia, which are usually found in groups, are of two kinds: some are broad and uniformly thick except for a slightly thicker head, while others are long, broad at the base, gradually tapering towards the apex, and ending in a cup-shaped head. Pycnospores are formed in large numbers. They are pale brown, thin-walled, ovoid, with one end obtuse and the other pointed, and 7 to 10 by 4 to 6 μ in diameter. The development of a transverse septum in their centre is the first stage in their germination. Perithecium-like structures were observed in a few cases both in nature and in cultures; these are elongated, cylindrical bodies, slightly thicker than the pycnidia, and either rounded or lobed at the top. A few asci were seen on slides prepared from the fungus; they were from 27 to 48 μ in length and 6 to 17 μ broad, and contained 5 to 8 round ascospores, 4 to 7 μ in diameter. An ascus obtained in a flask culture was 32·5 by 4·5 μ broad, with 8 ascospores, the largest 3·5 μ in diameter.

Cultures of the fungus were grown on various media, and are described in detail. On oat agar, bean agar, and the like, growth was better than in synthetic media. Pycnidia developed abundantly on all the media. Under ordinary conditions they were not formed in the dark, but they developed when the slides were placed in a dark incubator at a temperature of 29° C., thus indicating that temperature can replace to some extent the action of light.

The fungus, in the author's opinion, is dangerous in that it lowers the vitality of the host and renders it susceptible to the attacks of other organisms. It also lowers the quality of the lint in the attacked bolls.

PETCH (T.). **Studies in entomogenous fungi. XII. Peziotrichum lachnella; Ophionectria coccorum; Volutella epicoccum.**— *Trans. Brit. Mycol. Soc.*, xii, 1, pp. 44–52, 1 pl., 1927.

A Ceylon hyphomycete recorded by Parkin on *Hemichionaspis*

aspidistrae on a palm, and on *Aonidia* sp. on *Memecyclon*, has been collected again on *H. aspidistrae* and also on a Diaspid on *Bambusa*. It is now definitely referred to *Peziotrichum lachnella*. It is characterized by a rufous-brown stroma which gives rise to yellow-brown radial hyphae, which by interweaving and fusion may be united into a continuous stroma. The interwoven branches bear globose to subglobose, yellow-brown 'pseudospores'. Round the scale insect, or, in well-developed stromata, all over it, arise rigid, brown setae, which fuse laterally into fascicles. Very similar bodies to the pseudospores have been observed in *Septobasidium suffultum* and also in another fungus apparently of the same genus; in both these cases, however, they are apparently probasidia. The author considers that he has sufficient evidence that *Peziotrichum* is the sterile stroma of a new species of *Ophionectria*, *O. coccorum* Petch. This fungus has been repeatedly found on *Fiorinia juniperi* on *Juniperus bermudiana* at Peradeniya. The perithecial stromata produce fascicles of setae as in *Peziotrichum*, but no pseudospores. A collection has, however, been made on a scale on *Eugenia* at Bendaragama in which all the stromata bear pseudospores, and a few also have the perithecia of *O. coccorum*. It has not been possible to secure cultures from any stage of this fungus.

Volutella epicoccum n. sp., on *Parlatoria aonidiformis* on *Cullenia excelsa*, and on (?) *Lecanium* sp. on *Cinnamomum ovalifolium*, resembles *Peziotrichum* macroscopically in the stroma and fascicles of setae; its stromata are, however, composed of vertical conidiophores, bearing large conidia, 40 to 56 by 3 μ. No pseudospores have been found, and it has not been possible to prove any relationship with *Peziotrichum*.

TATE (P.). **On Ectomyces calotermi n.g., n.sp., an Ascomycete parasitic on Calotermes samoanus Holmgren (Isoptera, Protermitidae).**—*Parasitology*, xix, 1, pp. 54–60, 1 pl., 1 fig., 1927.

Organisms attached to the forelegs of a termite (*Calotermes samoanus*) in Samoa proved to be the fructifications of a Discomycete to which the name *Ectomyces calotermi* n.g., n.sp., has been given, with an English diagnosis.

Small, dark, waxy, roughly circular apothecia, measuring about 0·5 mm. in diameter at the base, 0·35 mm. at the rim, and 0·1 mm. from rim to base, are the only visible parts of the fungus. The base of the apothecium is closely applied to the chitin of the host, and from its centre a tuft of fungus cells penetrate the chitin and develop a hemispherical mass of radiating cells in the hypodermis of the host. This structure is regarded as a compound haustorium. Other simple haustoria arise, one from each of the basal cells of the peridium, penetrating the chitin as narrow, thin-walled hyphae, which enlarge at the tip. The hymenium consists of densely packed asci and paraphyses, and is paler in colour than the exterior of the apothecium.

The asci are cylindrical, 50 by 2 to 2·6 μ, somewhat swollen distally for about one-third of their length, and very thin-walled, except at the apex, where a cap-like structure is formed. The

uniseriate, hyaline, shortly cylindrical ascospores, measuring 4 to 5·3 by 2 μ, completely fill the lower two-thirds of the asci. Each ascus contains at least 8 ascospores, but occasionally 9, 10, or 11 may be observed.

The direct influence of *E. calotermi* on the host is apparently slight, the most noticeable effect being the above-mentioned degeneration of the hypodermis.

SCOTT (H. H.). **A mycotic disease of Batrachians.**—*Proc. Zool. Soc. London, 1926*, iii, pp. 683–692, 5 pl., 1926.

Heavy mortality prevailed during 1925 among salamanders, bull-frogs (*Rana catesbiana*), black-spotted and square-marked toads (*Bufo melanostictus* and *B. regularis*), and other Batrachians at the London Zoological Gardens as the result of a hitherto practically unknown fungous disease.

The symptoms of the disease are described, and a detailed account is given of the pathological anatomy and histology of the affected animals. Septate hyphae, frequently accompanied by nematode larvae, were found in the discharge from the ulcerous lesions marking the initial stages of the disease. They occurred also in many of the internal organs. It does not yet appear possible to arrive at any conclusion as to the part played by the nematodes in the etiology of the mycosis. They may produce local lesions which facilitate the entrance of the fungus, or pave the way for infection by their secretions or by local toxic action. Inoculation of pure cultures of the mould does not produce the disease in healthy animals when applied to the intact skin, to a scarified surface, or subcutaneously. No actual perforation of the skin by hyphae was detected. The mode of dissemination of the fungus is in all probability by the lymph.

Cultures of the organism on Sabouraud's medium with maltose developed a rugose white growth in five days or less. The fungus was identified as a new species of *Monilia* [? *Candida*], to which the name *M. batrachea* has been given.

JENKINS (ANNA E.). **Brown canker of the Rose.**—*Amer. Rose Annual, 1927*, pp. 161–183, 9 pl. (1 col.), 1927.

This paper brings together the known information regarding the brown canker of the rose (*Diaporthe umbrina*), now a widespread and important disease in the eastern half of the United States, based chiefly on studies at the Arlington Rose Test-Garden since 1917 [*R.A.M.*, iv, p. 541]. Further observations of the varietal susceptibility have shown that teas, hybrid teas, and hybrid perpetuals are most susceptible, but the disease has been observed on varieties of most of the other classes. Ramblers appear to be somewhat resistant. The symptoms of the disease on the stems (where it gives rise to large cankers), on the leaves, and on the flower petals are described, and a section is devoted to details concerning the causal organism, which is capable of infecting its host plant directly as well as through wounds. To check the spread of this disease, the author stresses the necessity of the transference of only healthy plants from place to place. The pruning out of diseased branches has failed to give control. Spraying with Bor-

deaux mixture plus lead arsenate, in order to prevent the initial infection lesions on the canes, was successful in 1924. In 1925 and 1926 good control was obtained by spraying with 4–4–50 Bordeaux plus 1 lb. fish-oil soap per 50 gallons. Seven applications were made in 1925, and five in 1926.

The distinguishing features of two somewhat similar rose diseases, the common and the brand canker, due to *Coniothyrium fuckelii* and *C. wernsdorffiae*, respectively, are also described and illustrated.

SALMON (E. S.) & WARE (W. H.). **Leaf rot of the Carnation. A new and dangerous disease.**—*Gard. Chron.*, lxxxi, 2099, pp. 196–197; 2100, p. 216, 4 figs., 1927.

The carnation disease due to *Pseudodiscosia dianthi* does not appear to have been recorded in Europe since first described in 1921 by Höstermann and Laubert (*Gartenwelt*, xxv, p. 65, 1921), except for an outbreak in Holland in which the causal organism was at first identified as a species of *Septogloeum* [*R.A.M.*, iv, p. 589] but afterwards recognized as *P. dianthi*.

It recently (January, 1927) caused a serious leaf rot of a seedling carnation variety, derived originally by crossing the variety Mrs. Brazier with border varieties, near Brighton.

Diseased plants are characterized by a rotting of the leaves, usually near the base, where transverse cracks occur which cause them to drop and shrivel. The central shoot of still unopened leaves may be pale and distorted from an attack at its base. Finally, the whole plant shows a rusty brown appearance, with occasional green leaves projecting from the curling, withered foliage. In no case were the stems found to be attacked.

The bases of recently attacked leaves are marked by grey-brown, purple-zoned patches, visible on both sides of the leaf, on which the acervuli of the fungus develop. The latter are up to 0·4 mm. in diameter. The spores are very variable in size and shape, hyaline, with 1 to 5 (usually 3) septa, and furnished with an appendage at each end, the apical one, up to 16 μ in length, being the longest. Including the appendages (absent in some acervuli) the spores measure up to 42 by 7 μ. They germinate readily, the germ-tube most frequently arising from the second cell from the base.

For the control of the disease the authors suggest careful selection of cuttings, which should be rooted in sand, kept as dry as possible, and planted out in clean soil. Diseased plants should be removed and destroyed, and it may be necessary to spray or immerse the plants in Bordeaux mixture to check infection.

DOWSON (W. J.). **A blossom wilt and stem rot of cultivated Antirrhinums and Schizanthus due to Sclerotinia sclerotiorum (Lib.) Massee.**—*Journ. Roy. Hort. Soc.*, li, pp. 252–265, 10 pl., 1926.

A detailed account is given of a disease of cultivated antirrhinums under glass, characterized by the death of the inflorescences and a portion of the main axes as a result of infection by *Sclerotinia sclerotiorum* [*R.A.M.*, iii, p. 580]. Certain species of *Schi-*

zanthus are attacked by the same organism with similar consequences.

The flowers, which assume a blanched appearance, are infected by the ascospores of the fungus (*a*) through the stigma and style, and (*b*) less often through the corolla and calyx. The mycelium passes back through the peduncle into the floral axis, in some cases extending for a distance of some 10 inches. Ascospores of *S. sclerotiorum* were obtained from *Antirrhinum majus*, *Cheiranthus allionii*, *Schizanthus retusus* and *S. wisetonensis*, *Campanula medium*, carrots, and beans (*Phaseolus vulgaris*). The sclerotia from all the above-mentioned hosts produce apothecia in the following summer when kept outside embedded in sand.

Inoculation experiments on *Antirrhinum* with ascospores from sclerotia from the same host produced up to 75 per cent. infection compared with only 25 per cent. with *Campanula* or *Schizanthus* material. It cannot yet be determined whether this difference indicates a state of feebly specialized parasitism on the part of *S. sclerotiorum*, or even the existence of distinct species on the various hosts.

Infection was more rapid, and the growth of the fungus more luxuriant, in a saturated atmosphere than in the relatively dry air of a greenhouse. No definite evidence is available as to the original source of infection in nature, but it is considered likely that humble-bees (*Bombus* spp.) conveyed the ascospores to the flowers. Diseased plants should be burnt in order to prevent the formation of sclerotia.

CURZI (M.). **Di uno speciale parassitismo dell' Ascochyta syringae.** [On a specialized parasitism of *Ascochyta syringae*.] —*Riv. Patol. Veg.*, xvii, 1–2, pp. 22–23, 1927.

Ascochyta syringae, hitherto known only as a leaf parasite of lilac (*Syringa vulgaris*) in Italy, has recently been found causing a wilting of the inflorescences and young shoots of this plant. The basal parts of the shoots showed a slight brown discoloration as the result of mycelial infection of the tissues. The fungus was isolated and inoculated into healthy shoots with positive results. The disease occurs only in the early spring, presumably in consequence of infection latent in the buds since the preceding autumn. During the winter the bracts of some of the buds showed the presence of well-developed pycnidia, which would account for the appearance of the mycelium on the resumption of vegetative growth.

DEIGHTON (F. C.). **On the occurrence of Diaporthe perniciosa or a closely related form on Lilac.**—*Trans. Brit. Mycol. Soc.*, xii, 1, pp. 70–73, 1927.

A fungus hardly differing from *Diaporthe perniciosa* [*R.A.M.*, iii, p. 217] was commonly isolated from the dead wood of lilac bushes [*Syringa vulgaris*] in Cambridge during 1924–6. Extensive die-back on trees growing in a shaded position resembled that attributed to the action of *D. perniciosa* on fruit trees. Underneath elongated, sunken areas, the wood was discoloured to the centre, the affected area being V-shaped in transverse section. *Diaporthe* and other species were isolated from this area. Surface-sterilized

diseased twigs, kept in a moist atmosphere, developed either pycnidia or perithecia or sometimes both, according apparently to the strain of the fungus. In culture the organism did not differ from *D. perniciosa*, except that pycnospore cultures of the lilac fungus, unlike *D. perniciosa*, gave a grey coloration to the medium. No perithecia developed in culture.

A large number of inoculations were carried out with the lilac *Diaporthe* and *D. perniciosa* on lilac and privet (*Ligustrum vulgare*) and on peach and plum under glass. Pycnospore suspensions or pieces of mycelium were inserted into T-shaped cuts, or placed on the cut ends of branches. Microscopic examination of the inoculated part showed the formation of a gum barrier [ibid., v, p. 502], which the fungus apparently could not pass.

The writer concludes that the evidence for the parasitism of the *Diaporthe* on lilac is unsatisfactory, but it seems likely that under unfavourable conditions for the host, the fungus can attack the wood either alone or associated with other organisms.

JACKSON (A. B.). **The Fusarium wilt of China Asters.**—*Scient. Agric.*, vii, 7, pp. 233–247, 3 pl., 1927.

The wilt disease caused by *Fusarium conglutinans* var. *callistephi* of China asters (*Callistephus chinensis*) is stated to be very prevalent in Ontario [cf. *R.A.M.*, vi, p. 215]. In soil which has become aster-sick a loss of 75 per cent. of the plants may occur. All varieties seem to be equally susceptible to the disease. The causal organism enters the roots and spreads upwards in the vascular system. Plants are attacked in the seedling and adult stages; in both the root system is more or less rotted away, and the whole plant becomes stunted and finally wilts and dies. The stems of mature plants collapse and show lesions and black streaks.

F. conglutinans var. *callistephi* was repeatedly isolated from diseased plants. It does not attack cabbage, while the causal organism of cabbage yellows, *F. conglutinans*, does not affect asters. Four other species of *Fusarium* that were isolated from diseased asters proved strongly pathogenic, one of them being identified as *F. angustum*. The cultural characters of the various species encountered are described, and morphological details of the pathogenic forms are given. On nitrate dextrose agar and nitrate lactose agar the percentage of three-septate conidia of *F. conglutinans* var. *callistephi* was higher than on any other media. The production of aerial mycelium in this species increases with age, but sporulation remains constant.

Experiments carried out at different soil temperatures showed that wilt occurred freely at 20° to 25° C., while very little infection was noticeable at 17° to 20°. The disease appeared to be equally severe in loamy, clay, or sandy soils.

When the soil is infected, seed treatment does not control the disease, but if the seed-bed soil is clean, soaking in mercuric chloride 1 in 1,000 or 0·25 per cent. uspulun for half an hour gives effective control. Satisfactory sterilization of aster-sick soil was obtained with 1 in 50 formaldehyde or 1 in 1,000 mercuric chloride when applied so as thoroughly to wet the top ten inches. Selec-

tion from healthy individuals which have survived in aster-sick soils gives promise of resulting in the production of resistant strains. Some of the plants raised from seed from apparently resistant plants have so far withstood the disease better than those raised from ordinary commercial seed, when sown in infected soil. As additional control measures it is recommended to remove and destroy all affected plants and also the refuse from the beds at the end of the season.

WORMALD (H.). **A disease of the Shasta Daisy.**—*Ann. Rept. East Malling Res. Stat. 1925, II Supplement*, pp. 96–97, 1 pl., 1927.

This is a fuller account of the leaf blotch of the Shasta daisy (*Chrysanthemum maximum*) than that already published [*R.A.M.*, v, p. 100]. The spores of the presumed causal organism, *Septoria leucanthemi*, frequently exceed 100 μ in length compared with a maximum of 70 μ for *S. chrysanthemella*. Shortly after the appearance of the writer's first paper, he was informed of the occurrence of the same disease on Hayling Island, Hants. A similar disease on *C. indicum* caused by *S. chrysanthemella* may be controlled by the removal of infected leaves and spraying with Bordeaux mixture, and these measures would probably be effective also in the present case. On no account should the rootstocks of diseased plants be divided up for propagation.

GOLDSTEIN (BESSIE). **The X-bodies in the cells of Dahlia plants affected with mosaic disease and dwarf.**—*Bull. Torrey Bot. Club*, liv, 4, pp. 285–293, 3 pl., 2 figs., 1927.

The author gives a brief account of her cytological investigation of dahlia plants affected with two apparently distinct virus diseases, mosaic and dwarfing, the symptoms of which are briefly outlined. She claims to have observed intracellular bodies resembling in many respects those described in mosaic of tobacco [*R.A.M.*, vi, p. 260], maize, *Hippeastrum* [ibid., iii, p. 598], and in the wheat rosette [mosaic] disease [ibid., iii, p. 452]. These bodies were found in all the tissues of leaf primordia, growing points, and mottled leaves, but not in yellow-margined leaves. They are stated to be frequently distinctly amoeboid in shape, with short, blunt pseudopodial protuberances. As observed in various cells, the forms of the bodies suggested very definitely a flowing and elongating movement. The bodies may be rounded or oval, or extremely elongated, the latter generally occurring in elongated cells. Large cells may contain several bodies of varying sizes. They are of a finely granular, fibrillar, and alveolar structure, and often contain peripheral vacuoles, differing in this from the X-bodies of tobacco [loc. cit.]. They also contain structures resembling small nuclei, and were found in all stages of division by constriction, from a slight equatorial narrowing to complete separation.

VAN HOOK (J. M.). **A new species of Graphium.**—*Proc. Indiana Acad. Sci.*, XXXV (1925), p. 231, 1926. [Received 1927.]

Since 1902 the author has made careful studies of a species of *Graphium* which was first collected near Ithaca, New York, and

is common in Southern Indiana on living leaves of *Hamamelis virginiana*. The fungus, to which the name of *G. hamamelidis* n. sp. has been given, produces on the leaves circular to oval, deep brownish spots, measuring 0·5 to 4 cm., with a broad, dark, vinaceous drab or brown border. The centres of the lesions fall out, leaving a lacework of veins. The synnemata, often arising from the veins, are mostly epiphyllous, simple, erect, gregarious, 500 to 825 μ in height, dark brown (paler towards the head), measuring on an average 50 μ in diameter, and attached to the leaf by an abruptly broadened base, 50 to 100 μ wide. The individual hyphae are very slender and firmly agglutinated, brown, with pale, spherical heads. The hyaline, navicular spores measure 5 to 7 by 2 to 3 μ.

NICOLAS (G.). **Sur un Pythium parasite du Marchantia polymorpha L.** [A species of *Pythium* parasitic on *Marchantia polymorpha*.]—*Bull. Soc. Myc. de France*, xliii, 1, pp. 119–121, 1 fig., 1927.

This is a somewhat more detailed version of the author's account of his discovery of a species of *Pythium* parasitizing the thallus of *Marchantia polymorpha*, which was noticed from another source [*R.A.M.*, v, p. 367].

FERGUS (E. N.) & VALLEAU (W. D.). **A study of Clover failure in Kentucky.**—*Kentucky Agric. Exper. Stat. Bull.* 269, pp. 143–210, 21 figs., 1926. [Received July, 1927.]

A detailed account is given of investigations started in 1921 on experimental fields at Lexington, Campbellsville, and Berea, Kentucky, with a view to determining the causes of clover failure ('clover sickness' of the soil) in that State [*R.A.M.*, iii, p. 194]. The evidence collected indicated that clover failure is indirectly caused by unfavourable environmental conditions resulting from a depletion of nutritive elements in the soil, and directly by pathogenic organisms which attack the enfeebled plants; it also pointed to a direct relationship between the failure and root decay. Isolations made from rotting rootlets of red clover (*Trifolium pratense*), alsike clover (*T. hybridum*), and lucerne showed no consistency in the organisms obtained from any of these species. Twenty-four isolations from the roots of red and alsike clovers comprised several distinct species of *Fusarium*, including *F. moniliforme* [*Gibberella moniliformis*] (a form different from that on maize), *F. solani*, and a form resembling *F. oxysporum*. In fourteen cultures of *Fusarium* isolated from lucerne roots there were seven which apparently differed each from all the others, four which appeared to be identical amongst themselves, and the last three apparently represented another species. All the species isolated belonged to the *elegans* or the *martiella* sections. Besides these, several other genera of fungi were isolated. From various lots of clover seed which had been treated for 25 minutes in a 1 to 250 formalin solution at 40° C. and germinated on agar, the authors isolated a species of *Alternaria* in ten cases, and a sterile mycelium which on potato dextrose agar produced a rather profuse growth of rust-coloured hyphae in three cases.

Inoculation experiments on seedlings grown in sterilized nutrient agar showed that all the organisms isolated from the roots were pathogenic to clover and lucerne, the seedlings being killed in a comparatively few days in the case of the more injurious organisms. The attack usually occurred at the surface of the agar, resulting in a typical damping-off. The less injurious species usually killed the seedlings in time, but took much longer to do this. This was especially true when the seedlings were older, with two or three true leaves and a fairly hard stem. Other named cultures of *Fusarium* [a list of which is given] were also tested, and a number of species that are known to cause wilts and root rots of various plants were found to kill lucerne and clover seedlings on nutrient agar in a period of nine days or less. *F. moniliforme* from maize proved to be less injurious to clover than the form isolated from the roots of the latter. The seed-borne organisms were slightly injurious, but acted much more slowly than the species of *Fusarium* from the roots.

In addition, isolations from rotting tobacco roots representing apparently at least twelve distinct species of *Fusarium*, belonging almost without exception to the sections *elegans* and *martiella*, were tested on clover and lucerne seedlings, and found to kill them as readily as those mentioned above.

WOLFE (T. K.) & KIPPS (M. S.). **Red Clover experiments.**—*Virginia Agric. Exper. Stat. Bull.* 252, 24 pp., 12 figs., 1 map, 1926. [Received July, 1927.]

Under Virginian conditions anthracnose of clover (*Colletotrichum trifolii*) [*R.A.M.*, v, p. 431; vi, p. 100] is a very important factor in the causation of winter injury. The incidence of infection is generally lower in autumn than in spring sowings. As a rule, foreign-grown seed is less reliable than the native varieties. Thus in 1924 Hungarian and Italian clovers were so severely attacked by anthracnose that about half the plants were killed in many plots at the Blacksburg Experiment Station. The best sources for the supply of anthracnose-resistant clover are Tennessee, Virginia, Maryland, Ohio, and Michigan.

FARLEY (A. J.). **Report of Department of Pomology.**—*Forty-sixth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1925*, pp. 114–127, 3 pl., 1926. [Received May, 1927.]

Good results in the control of peach scab [*Cladosporium carpophilum*] were given in 1924 by three to five applications of the standard New Jersey dry-mix sulphur lime 8–8–50 [*R.A.M.*, v, p. 311], colloidal sulphur 5 lb. per 50 galls. water, dry-mix 6–6–50, 8–2–50, 4–4–50, and 8–6–50 (the last four with lead arsenate in two applications). Dritomic and a combination of sulphur and lead arsenate without lime caused slight defoliation.

Severe injury was caused to Grimes and McIntosh apple trees (especially the former) by the application of concentrated lime-sulphur (1 in 25) with and without lead arsenate (2 lb. per 50 galls. water). The worst burning occurred on trees sprayed at petal fall. Bordeaux mixture 4–2–50 and 4–4–50, with and without lead

arsenate as above, caused a mottled, brownish discoloration on the under side of the leaf following the pink bud application. A rather severe leaf drop then occurred, succeeded by the fall of many of the young fruits. Some entire blossom clusters and even whole spurs were killed by the spray. The injury inflicted by later applications took the form of numerous small, black dots on the upper surface of the leaves, followed by defoliation. Severe russeting, often accompanied by deformation of the fruit, was observed about a month after the pink bud application.

Experiments were carried out to test the relative efficacy of spraying and dusting in the control of fungous diseases and insect pests of apples. Very little scab [*Venturia inaequalis*] was present during 1924 and infection was reduced to a minimum by both treatments. Dusting was somewhat cheaper than spraying, the total cost of the former operation in an orchard containing four blocks of 400 trees each being $214·80, and that of the latter $280·31.

NATTRASS (R. M.). **The white root rot of fruit caused by Rosellinia necatrix (Hart.) Berl. (Progress report).**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1926*, pp. 66–72, 2 pl., 1927.

Rosellinia necatrix, the organism causing white root rot of fruit trees, appears to be fairly widely distributed in the warmer parts of the British Isles, and is known to have a wide range of hosts among cultivated plants. It has recently been reported on apple trees in Somerset and the Isle of Wight, and on narcissus bulbs, arum corms, potatoes, and elm roots in the Scilly Isles. The external symptoms, which resemble those of trees affected with *Armillaria mellea*, are described. The distinguishing features of the disease are found on examination of the root systems of affected trees. The fibrous root system almost entirely disappears, and the older main roots are covered with a greenish-grey mycelial mat, which develops a flocculent web of whitish strands or ribbons, quite distinct from the rhizomorphs of *A. mellea*. After the death of the host, in two or three years, the web disappears, leaving the root surface dotted over with small, rounded, black sclerotia. Newly attacked young roots are invested with pure white, flocculent mycelium, and the parts so clothed are soft and rotted. The soil in the vicinity of a diseased tree is permeated by strands of this diffuse white mycelium spreading in all directions.

Inoculation of a four-year-old Cox's Orange Pippin apple by wounding the main root, and of a Bramley's Seedling tree of the same age by infection of the soil, was unsuccessful, as was the inoculation of the collars of thirty six-year-old Warner's King apple trees, but inoculations of three-year-old apple seedlings in pots with the diffusely growing mycelium from sand cultures succeeded readily. By growing French beans in infected soil in a heated greenhouse, characteristically diseased plants were obtained. Microscopic examination of diseased plants showed a close contact between the fungus mat and the outermost layer of cells, but little actual penetration into deeper tissues. No infection resulted when the experiment was repeated later in the season when the temperature was lower.

Two types of mycelium characteristic of this fungus are described, namely, the greenish-grey to white rhizomorph-like and fan-shaped structures probably marking the site of destroyed roots, and the diffuse, fine, white mycelium which occupies the soil cavities, and is responsible for the infection of new plants. The writer is of the opinion that the fungus can only attack the fine roots and that death is due to the destruction of these. No fructifications have been seen by the author under natural conditions, but the sclerotia evidently represent a resting stage, and can, under suitable conditions, give rise to the fine, white 'exploration hyphae'. Abundant conidial fructifications, quite agreeing with those described by Viala, were produced in culture after 12 to 14 weeks.

The spread of the disease can be largely prevented by the following measures: the removal and destruction of infected trees with as much as possible of the root system; the examination of the roots of trees in the neighbourhood of diseased ones; the uprooting of young trees, in early stages of attack in autumn or winter, trimming off the affected roots, and replanting in clean soil; and bare fallowing with frequent cultivations of infected ground to starve out the infection hyphae. On the Continent, soil treatment with carbon bisulphide is said to have given good results.

YOUNG (H. C.) & MAY (C.). **The timing of Apple scab sprays.**—*Ohio Agric. Exper. Stat. Bull.* 403, 28 pp., 3 figs., 8 graphs, 1 map, 1927.

This bulletin gives an account of experiments carried out in the period from 1924 to 1926 with a view to determine the time when sprays should be applied to control apple scab (*Venturia inaequalis*) with the maximum efficacy under Ohio conditions. Preliminary tests indicated that the state of the seasonal development of the trees was not a reliable indicator, as infection can take place readily at any time after the buds begin to open, depending only on the supply of ascospores present in the orchard, sufficient air moisture, and a suitable temperature. It was shown that the sprays were most effective when applied just previous to a rainy period which leads to an intensive discharge of ascospores from fallen leaves. A method was therefore devised to allow of predicting such periods, which, in conjunction with a regular weather forecasting service, yielded excellent control results in 1926 at numerous points in Ohio. It was found that the sprays gave protection over a comparatively short period, and should be repeated before each intensive discharge of the ascospores.

BALLOU (F. H.) & LEWIS (I. P.). **Standard and dilute sprays in Apple scab prevention.**—*Amer. Fruit Grower*, xlvii, 3, pp. 28–29, 1927.

Continuing their experiments in the control of scab [*Venturia inaequalis*] on Delicious, Stayman, and Rome Beauty apple trees in Ohio [*R.A.M.*, iv, p. 611], the writers found that the best results were given by the following schedule: (*a*) for the pink bud application: 3 lb. dry lime-sulphur and 5 lb. hydrated lime to 50 galls.

water; (*b*) for the petal fall, two-, four-, and ten-weeks applications: 1½ lb. dry lime-sulphur, 5 lb. hydrated lime, and 1¼ lb. lead arsenate to 50 galls. water. A condensed summary of the five years' experiments (1922–1926) is presented in tabular form, and the results obtained with the different schedules are briefly discussed. Sulfocide 1 in 200 [ibid., v, p. 438] used in conjunction with kayso, and colloidal sulphur 5–50, also gave satisfactory results.

MELHUS (I. E.). **Crown gall and graft knots of Apples.**—*Amer. Fruit Grower*, xlvii, 3, pp. 4, 41, 3 figs., 1927.

A popular description is given of crown gall [*Bacterium tumefaciens*] and graft knots on apple trees. The latter type of overgrowth, which is stated to be far more prevalent than the former, consists of callus tissue formed in the process of healing of the stock and scion at the union [*R.A.M.*, vi, p. 150]. These knots, which are mostly produced at the end of the scion lip but may occur at any point of the union, result from the stoppage of the downward flow of food materials on that side of the graft where continuity does not exist. Recent laboratory trials showed that in one lot of 100 two-year-old 'cut-backs' bearing graft knots and galls, the water flow capacity was reduced by 30 per cent. in comparison with that of healthy trees [ibid., vi, p. 151]. In another lot of Wealthy, Salome, and Jonathan trees, the water flow was reduced by 69, 21, and 42 per cent., respectively. Longitudinal sections through the union of knotted trees showed an evident lack of connexion between stock and scion in 63 per cent. of the cases. Jonathan and Wealthy trees bearing galls or graft knots have been observed at the Iowa Agricultural Experiment Station to make slow and one-sided growth. On the side of the tree above the graft the top is small and the trunk concave. The roots of such trees are largely developed on the side opposite the graft knot.

BURKHOLDER (C. L.). **Inarching against collar rot.**—*Amer. Fruit Grower*, xlvii, 3, p. 24, 1 fig., 1927.

The popular Grimes Golden apple is stated to be very susceptible to collar rot in Indiana [*R.A.M.*, iii, p. 338]. A section of the bark dies round the base of the tree, and sometimes the affected area may extend nearly to the main branches. The disease can be arrested in some degree by cutting away the dead bark to live tissue, but the best method of protection is the planting of double-worked trees, in which a Grimes bud is inserted about 15 inches above the ground on some other resistant variety. However, practically all the present bearing acreage of Grimes (the value of which ranges from $ 50 to $ 100 per tree) was planted before this method of propagation was started. In such cases inarching with one-year trees seems to be the best way of supplying the top of the tree with food. The young trees should be planted in the autumn or early spring and heavily manured. In June, or as soon as the bark peels easily, the tops of the young trees should be inarched well above the rotted area. Concise directions for this method of grafting are given.

AMOS (J.), HATTON (R. G.), & MACKENZIE (A. D.). **The incidence of 'die back' disease in Plum trees.**—*Ann. Rept. East Malling Res. Stat. 1925, II Supplement*, pp. 33–37, 1 diag., 1927.

In 1923 some young plum trees, covering about six acres at the East Malling Research Station, began to show symptoms of die-back of the type described by Miss Cayley [and attributed by her mainly to *Diaporthe perniciosa*: *R.A.M.*, iii, p. 217; v, p. 343]. A study of the incidence of the disease in relation to stock and scion combinations gave no indication of greater severity on any particular rootstock, and only in one case out of over one hundred could any unhealthiness of the root be observed. On the other hand, the scions were found to differ markedly in their susceptibility to die-back, the Victoria variety being much more liable to attack than Czar, President, or Prolific. The distribution of the disease appeared to bear no relation to the position of the affected trees on the plot, and there is no conclusive evidence that infection radiates from any given centre.

GARD (M.). **A propos des 'mourios' de l'Aveyron.** [Notes on the 'mourios' in the department of Aveyron.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 1, pp. 24–26, 1927.

'Mourios' [death-traps] is a local term designating more or less deep soil depressions on the western slopes of the Causse de Comtal in the department of Aveyron, in which vines, fruit trees, and occasionally walnuts, are invariably killed by a root rot. An investigation carried out by the author showed that the causal organism is *Armillariella* [*Armillaria*] *mellea*, which finds exceptionally favourable conditions in the low-lying moist soil, rich in humus, of these areas. A brief description is given of a method for a rapid cultural distinction of the sterile mycelium of *A. mellea* from that of *Rosellinia necatrix*.

HOGGAN (ISMÉ A.). **The parasitism of Plowrightia ribesia on the Currant.**—*Trans. Brit. Mycol. Soc.*, xii, 1, pp. 27–44, 4 pl., 2 figs., 1927.

This paper describes the results of an investigation to determine the natural mode of infection of currants by *Plowrightia ribesia*, and the extent to which the latter might be regarded as a parasite of these plants. The fungus was commonly found on red currants, less frequently on black, and never observed by the writer on gooseberries. The mycelium is found in all tissues of the stem, and is particularly abundant in the phloem and pith. A description is given of its characters and of the diseased condition with which it is associated.

From experiments in which ascospore suspensions or mycelium were inoculated into wounds on healthy, partially cut back, and artificially killed branches of young red and black currant bushes, it was found that *P. ribesia* is unable to infect normal healthy branches even when these are wounded. Infection occurs by ascospores through spurs left in pruning, or through wounds on branches which from some other cause are weakened and unhealthy. This conclusion was supported by field observations. The fungus readily invades moribund tissue, and must establish

itself on such tissue before being capable of attacking the living portions of the host. Once established the mycelium works backwards, until the way is barred by cork and resinous layers which develop in the stem. These layers, however, are not always successful in checking the advance of the mycelium. The ascospores being liberated under natural conditions from the end of April to June, pruning currants in February or March is open to objection since the spurs are then susceptible to ascospore infection.

Inoculation experiments also proved that *Nectria cinnabarina*, commonly associated with *P. ribesia* in nature, does not prepare the way for the latter.

The death of the twigs is attributed to some toxic action of the fungus, rather than to the plugging of the vessels, since frequently the wood appears to be relatively free from mycelium.

The behaviour of the fungus in culture, including the germination of the ascospores and the formation of conidia, is described. Perithecia were never obtained in culture, although the characteristic black stromata were developed, and at a low temperature a slight differentiation, comparable with the early stages of the development of perithecia, was seen.

A highly specialized method of forcible ejection of the ascospores from the ascus was observed by the writer. This takes place only after rain, and the spores are disseminated chiefly by the wind.

The control measures recommended are simple, namely, to prune back to the surface of the parent branch instead of leaving spurs; to cut out and destroy all infected branches; and to maintain by cultural methods a healthy condition of the bushes.

AMOS (J.), HATTON (R. G.), KNIGHT (R. C.), & MASSEE (A. M.). **Experiments in the transmission of reversion in Black Currants.**—*Ann. Rept. East Malling Res. Stat. 1925, II Supplement*, pp. 126–150, 3 pl., 1 diag., 1927.

The results of further experiments [which are fully described and tabulated] in the transmission of reversion in black currants [*R.A.M.*, v, p. 307] gave fresh indications of a correlation between infection with the big bud mite [*Eriophyes ribis*] and the development of this condition. Ninety per cent. of normal bushes developed reversion after successful establishment on them of the mites, and 92 per cent. of the controls, in which big bud did not appear, showed no symptoms of reversion. The condition developed in 100 per cent. of previously normal individuals grafted to or inarched with reverted plants, and in such cases there is strong evidence that transmission occurred independently of mites. Negative results were given by attempts to induce reversion by metabolic disturbance and to transmit the disease by sap transfusion. There is no evidence of transmission by the seed, and the pruning knife is not a regular source of infection.

BALL (E.). **Some observations on 'red plant' of Strawberries.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1926*, pp. 73–77, 1 pl., 1927.

In this paper the author reports observations on the 'red plant'

disease of strawberries [*R.A.M.*, iii, p. 281; v, p. 470]. The condition is recognized most easily in spring by the total or partial sterility of the plants and by leaf abnormalities, such as reduction in size, distortion of the lamina, and shortening of the petiole, which becomes thickened at the base, tapers upwards, and is almost hairless. Only in certain varieties, e.g., Royal Sovereign, does the red pigment, giving the popular name to the disease, develop in the petiole and lamina. Continued observation of affected plants throughout the season showed that the following symptoms could be observed in autumn: (1) the characteristic leaf symptoms were present, though no red pigment was developed in any variety; (2) an affected crown sometimes produced no new normal leaves; (3) new crowns were generally thin and weak, and bore leaves with long, thin, almost hairless petioles; (4) new healthy normal leaves were produced by the growth of daughter crowns. The last point explains the difficulty in recognizing 'red plants' late in the year.

From an examination of three generations of six strains of strawberry plants propagated by runners, it was found that the strain most severely affected in the first generation was also the worst in the second and third generations. Thus it is evident that the progeny of 'red plants' are likely themselves to be 'red plants', and that the control of the disease by roguing is possible. Observations in fields where the latter had been carried out confirmed this suggestion.

The disease appears to be widespread in all the important strawberry-growing districts in the country. The following commercial varieties were found in 1926 to be susceptible: Royal Sovereign, Madame Kooi, Stirling Castle, Bedford Champion, and Sir Joseph Paxton.

PETHYBRIDGE (G. H.) & NATTRASS (R. M.). **Notes on Nectria rubi.**—*Trans. Brit. Mycol. Soc.*, xii, 1, pp. 20–27, 1927.

In the first part of this paper Pethybridge gives an account of some work carried out in Ireland a few years ago in conjunction with Lafferty. A description is given of a species of *Nectria*, considered to be *N. rubi*, found at the base of diseased raspberry canes from Co. Dublin and Co. Down. When the decaying roots were kept moist a species of *Fusarium* developed on them. An account of this fungus is given. Cultures on various media were started from single ascospores and single conidia. These were found to behave similarly in every respect. In each series the *Fusarium* stage developed rapidly, and after nearly six months perithecia also developed in both types of culture, so that the connexion between the two stages was proved conclusively. In the ability to liquefy gelatine, in the development of a deep claret or violet coloration in the substratum, as well as in morphological characters, the fungus was almost identical with *N. rubi* as described by Osterwalder. The latter's inoculation experiments with conidia, and those of the present writer with ascospores, gave negative results, so that the pathogenicity of the fungus is not yet established.

The second part of the paper, by Nattrass, contains a description

of raspberry canes from the west of England, suffering from a disease which he terms 'crown rot'. Perithecia of a *Nectria* were obtained from some of these. The morphological characters, which are described in detail, agree closely with those of the organism observed by Pethybridge, and with Mrs. Alcock's description of *N. rubi* [*R.A.M.*, v, p. 307]. Sporodochia of the *Fusarium* stage were not obtained on the plants, but isolations from the inner root tissues yielded a violet mycelium which produced *Fusarium* conidia identical with those produced in cultures derived from ascospores. A comparative study of cultures derived from single ascospores and single conidia showed a close similarity in the two series, and in apple wood and raspberry root cultures perithecia developed after about eight weeks.

N. rubi has been definitely associated with 'crown rot' only in a few cases, and invariably in wet areas or after a wet season. *Diaporthe perniciosa* almost always appears to be also present. The author suggests that, as a result of the abnormally damp conditions, the normal 'plug' formation at the base of the previous year's canes is not formed, and such fungi as *D. perniciosa* gain entrance. *N. rubi* may then be secondary or may be partially responsible for the death of the plants.

COLBY (A. S.) & ANDERSON (H. W.). **Diseases of Brambles in Illinois and their control.**—*Illinois Agric. Exper. Stat. Circ.* 305, 20 pp., 1 col. pl., 4 figs., 1926.

Popular notes are given on the diseases of blackberries, raspberries, and dewberries in Illinois, with directions for their control. Anthracnose (*Plectodiscella veneta*) occurs on red, purple, and black raspberries (the last-named being the most susceptible), blackberries, and dewberries. The Quiller raspberry is practically immune, the Cumberland, Plum Farmer, Gregg, Munger, Older, and Honey Sweet moderately susceptible, while Scarff and Earhart are highly susceptible. This disease may be controlled by the application of lime-sulphur (5½ in 50 galls. water for the delayed dormant and 1 in 50 for the pre-bloom spray). The addition of ½ lb. casein-lime per 50 galls. of solution is recommended.

Cane blight (*Leptosphaeria coniothyrium*) affects only red and black raspberries (especially the latter) in Illinois. The causal organism may persist on old canes for at least four years after death. It has also been found to produce a serious canker on apple trees in Kansas and a fruit spot of apple in New York. Control should be based on sanitary measures, with special care to avoid wounding.

Crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) is probably the most serious disease of brambles in Illinois, 10 to 50 per cent. of the crop frequently being lost through this cause. Red raspberries, except the everbearing Ranere (St. Regis) variety, are particularly susceptible. Heavy mulching with straw has been found to prolong productivity in affected plantations.

Leaf spot (*Mycosphaerella rubi*) is prevalent on red raspberries, but causes little damage as a rule. Spur blight (*M. rubina*) is also common on red raspberries, but it has seldom been observed to cause

much injury in Illinois. In Colorado, where it is the most serious disease of raspberries, good control has been obtained by four applications, at fortnightly intervals, of 3–4–50 Bordeaux mixture plus 2 lb. resin-fish-oil soap. This treatment may also be applied, if necessary, for the control of leaf spot.

Orange rust (*Gymnoconia interstitialis*) occurs principally on blackberries and dewberries, but black raspberries are sometimes affected. All diseased plants should be dug up and destroyed in the early spring. The cultivation of the resistant Snyder and Eldorado varieties is also recommended.

The virus diseases, leaf curl, mosaic, and streak [formerly known as eastern blue stem], are believed to be the principal cause of the 'running out' of raspberry plantations in the older fruit-growing sections. Leaf curl, which is more prevalent and destructive than mosaic in Illinois, occurs chiefly on red raspberries of the Scarff, Honey Sweet, and Cumberland varieties. Mosaic is found principally on red and purple raspberries, Cuthbert, King, Perfection, and Marlboro being particularly susceptible, while Redpath (a strain of Latham) is resistant. Streak affects nearly all the commercial varieties of black raspberries. In 1924 this disease caused losses up to 60 per cent. of the crop in the Bloomington and East Peoria districts. Aphids (especially *Aphis rubiphila*) are instrumental in the spread of all the virus diseases.

Brief directions are given for securing healthy stock, with notes on the rotation of crops, soil management, and pruning practices.

G-C. (J.). **Maladies du Mûrier.** [Diseases of the Mulberry tree.] —*Rev. de Bot. Appliquée*, vii, 67, pp. 213–214, 1927.

The author describes briefly the symptoms associated with the most commonly occurring diseases and pests of the mulberry tree in France, and the means of control suitable for each.

Root rot (*Agaricus melleus*) [*Armillaria mellea*] destroys a considerable number of trees, which are often killed off two or three years after planting; *Rosellinia aquila* and *Dematophora* [*R.*] *necatrix* also attack the roots. Disinfection of the soil with carbon bisulphide or a 10 per cent. copper sulphate solution is recommended, or a copious application of lime. Before planting new stock disinfection of the roots in copper sulphate solution is advised. Leaf spot (*Cylindrosporium mori*) is prevalent under moist conditions but does very little to hinder growth. Coral spot (*Nectria cinnabarina*) is evident on branches killed by frost. A disease referred to as 'maladie noire' or 'feu volage', resembling the coral spot but attacking the under side of the branches, appears to be due to an undetermined fungus; for its control the injured bark should be stripped off and the wood cut out to a thickness of 1 to 2 cm., the wound being painted with iron sulphate. Heart-wood rot (*Polyporus hispidus*) can be effectively treated by cutting out the injured parts and painting the wound with a solution of 50 kg. iron sulphate, 1 kg. sulphuric acid, and 100 l. water. The trees should not be stripped of leaves [for silkworm feeding] before the age of two or three years, and additional applications of manure should be given to them where this fungus is prevalent.

DEMAREE (J. B.) & COLE (J. R.). **Dusting with monohydrated copper sulphate and lime for control of Pecan scab.**—*U.S. Dept. of Agric. Circ.* 412, 8 pp., 1927.

This paper embodies the results of experiments carried out in 1926 at Thomasville and Albany, Georgia, in the control of pecan scab (formerly known as *Fusicladium effusum*) [now transferred to *Cladosporium*: *R.A.M.*, vi, p. 106]. Four to six applications of a mixture of 20–80 monohydrated copper sulphate and lime dust, analysing approximately 7 per cent. metallic copper, effectively controlled this serious disease on the Schley and Alley varieties [ibid., vi, p. 107]. Details are given of the mode of application of the dust, which should be used at the rate of 1 to 2 lb. per tree at the first bearing age and at 8 to 12 lb. per tree for 20- to 25-year-old trees. The cost of the dust is 6 to 7 cents or less per lb., and two men can treat 50 to 150 trees per hour with a machine costing $450.

CARNE (W. M.). **Dusting for fungous diseases.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 1, pp. 14–16, 1927.

The author briefly discusses the advantages and drawbacks of the use of fungicidal dusts (other than sulphur against mildews) as compared with sprays for the control of fungous diseases of crops. He comes to the conclusion that under Western Australian conditions the dusts so far available are inferior in efficacy to sprays, and may be considered as convenient substitutes for the latter only in cases where disease is not likely to be severe. Where there is a liability to severe outbreaks or where treatments have to be applied during the wet season spraying cannot be replaced by dusting.

FLOR (H. H.). **The fungicidal activity of furfural.**—*Iowa State Coll. Journ. of Science*, i, 2, pp. 199–223, 1927. [Abs. in *Chem. Abs.*, xxi, 11, p. 1864, 1927.]

Toxicity studies were carried out on *Puccinia coronata holci* [*P. lolii*: *R.A.M.*, ii, p. 209], *Ustilago hordei*, and *Sphacelotheca sorghi* with dilute solutions of formaldehyde, butyraldehyde, benzaldehyde, furfural, propionaldehyde, and acetaldehyde, the first three of which proved to be the most toxic. Apparently the furan nucleus was a minor factor in the toxicity of furfural. Metallic furoates were markedly toxic in accordance with the toxicity of the metal carried. Furyl alcohol did not show the same toxicity as the aldehyde, suggesting that the furyl radical is not the toxic portion of the compound.

Raising the temperature of the solution accelerated the toxicity of furfural to the sclerotia of *Rhizoctonia* [*Corticium*] *solani*. Covering increased the efficacy of the furfural treatments.

The injury caused by furfural vapour o germinating wheat seed was greatly increased in the presence of water, while with formaldehyde vapour the reverse was the case. Seeds treated with formaldehyde solutions, dried and stored for varying periods before planting, showed cumulative injury, while those treated with furfural did not. Soaking the seed with water or furfural solutions ranging from 0·05 to 0·5 per cent., or sprinkling with water or fur-

fural solutions from 0·33 to 2 per cent., greatly increased the incidence of wheat bunt [*Tilletia levis*]. Similar treatments with oats and barley only slightly affected the percentage of smut [*Ustilago avenae* and *U. hordei*], both of which were reduced or eliminated by soaking or sprinkling with formaldehyde solutions. Dust derivatives of furfural decreased the incidence of these diseases but failed to control them altogether.

Mercuric chloride dusts or a mixture of two parts mercuric chloride dust to one part copper carbonate, sil o'cil, or furfuramide considerably reduced but did not entirely eradicate oat smut. The addition of furfuramide to mercuric chloride apparently decreases the efficiency of the latter. Mercuric chloride dust was found to be injurious to the germination of wheat and oats. Dust derivatives of furfural, and copper carbonate, improved the germination of inferior wheat seed.

Immersion of seed-potatoes in solutions of 1 in 100, 1 in 50, and 1 in 33 furfural for two minutes at 50° C. controlled *C. solani* as well as the 1 in 120 hot formaldehyde treatment in field tests in 1924. The 1 in 200 furfural and the furfuramide dust treatments were unsatisfactory. In the 1925 field trials, the hot 1 in 120 formaldehyde gave the best control of *C. solani*, though the other treatments mentioned were also fairly efficacious.

FLEMING (C. S.) & REEDY (J. H.). **Waste sulphite liquor as an agricultural spray.**—*Chem. & Metall. Engin.*, xxxiv, 3, p. 159, 1927.

Recent studies at the Department of Chemistry, Illinois University, are stated to suggest a wide application of waste sulphite liquor from paper mills as a fungicide and insecticide. The product contains mainly calcium bisulphite, together with 0·2 to 0·7 per cent. sulphur dioxide in the free state. These should react with hydrogen sulphide to give the following precipitate of sulphur and calcium sulphide: $Ca(HSO_3)_2 + 5\,H_2S = CaS + 6\,S + 6\,H_2O$; $SO_2 + 2H_2S = 3\,S + 2H_2O$. The resultant combination approximates in composition to the standard lime-sulphur spray.

On saturation with hydrogen sulphide, the sulphite liquor changes from deep brown to chocolate, due to the separation of free sulphur. The liquor contains 7 to 9 per cent. of organic matter, principally of a sugary substance which helps to maintain the sulphur in suspension for several hours. The permanence of the suspension may be greatly improved by the addition of 0·5 per cent. gelatine or maize sugar.

Sulphite liquor treated in this way has been tested as a spray material with favourable results, and it is claimed that the efficacy of the above compound is several times that of the usual run of sulphur sprays, doubtless owing to the finely divided nature of the precipitate. The organic content of the liquor is valuable in preventing flocculation, increasing adhesiveness, and retarding evaporation. The sulphuretted liquor contains only a small amount (0·5 to 1 per cent.) of active sulphur. By adding a small quantity of hydrochloric acid or other strong electrolyte, the sulphur can be precipitated and separated by filter-pressing as a brown, gummy solid. This product is readily wetted and may easily be resuspended, giving

a milky mixture which does not settle for hours. The filtrate from the sulphur precipitate contains most of the fermentable materials and may be utilized in making alcohol.

DANGEARD (P. A.). **Libération, par voie traumatique, de la symbiose fungique de plantules de Cattleyées.** [Liberation of *Cattleya* seedlings from fungal symbiosis as a result of injury.] —*Comptes rendus Acad. des Sciences*, clxxxiv, 12, pp. 763–764, 1927.

The author states that *Cattleya* seedlings growing in a compost of sphagnum and *Polypodium* roots frequently have the basal part of their protocorm eaten away by the larvae of the *Polypodium* fly (*Sciara* sp.), without any further injury. When such seedlings are kept in sufficiently dry conditions, they recover, putting out a lateral root and continuing to develop normally. Cross sections showed that in such cases the plants are without their normal symbiosis with *Rhizoctonia*. Two theories are advanced to explain this fact, (1) that since the surviving part of the protocorm contains chlorophyll, this substance may be able to inhibit the development of the symbiotic fungus in *Cattleya*, or (2) that the seedlings are immunized by the former infection from renewed attacks of the fungus. The conclusion drawn from this observation is that once the *Cattleya* seedlings have acquired the capacity of assimilation, symbiosis is no longer necessary for their further development.

SCHAFFNIT (E.) & VOLK (A.). **Ueber den Einfluss der Ernährung auf die Empfänglichkeit der Pflanzen für Parasiten (1. Teil).** [On the influence of nutrition on the susceptibility of plants to parasites (Part 1).]—*Forsch. auf dem Gebiet der Pflanzenkrankh. u. der Immunität im Pflanzenreich*, iii, pp. 1–45, 9 figs., 1927.

A series of experiments was carried out to determine the influence of nutrition on the susceptibility of plants to the attacks of fungous parasites. The plants were grown in pots on quartz sand with an admixture of 6 per cent. peat. In each series some of the pots received none, a little, a normal quantity, and an excess, respectively, of each of the main nutrients, nitrogen, potash, and phosphoric acid. The inoculations were made in a greenhouse where the temperature was maintained at 23° to 25° C., with an air humidity of 90 to 100 per cent. The factors determined in each test were (1) the incubation period; (2) the time elapsing between inoculation and the fructification of the parasite; (3) the development of the fungus after varying intervals of time; (4) the degree of infection; and (5) the type of infection.

The following plants and parasites were used: goosefoot (*Chenopodium album*) inoculated with *Peronospora effusa*; potatoes with *Phytophthora infestans*; peas with *Ascochyta pisi*; red clover with *Erysiphe polygoni*; sugar beets with *Uromyces betae*; broad beans with *U. fabae*; endives [*Cichorium endiva*] with *Puccinia cichorii*; wheat with *Erysiphe graminis* and *Puccinia triticina*; barley with *E. graminis* and *P. simplex*; rye with *P. dispersa*; maize with *Ustilago maydis* [*U. zeae*]; and tomatoes with *Cladosporium fulvum*.

The results of the experiments [which are described in detail

under each plant] showed that the incubation period is scarcely affected by nutrition. This factor, however, influences the length of time between infection and the development of fruit bodies, the latter being absent in the case of plants receiving no nitrogen or no phosphoric acid. In general, the length of this period is correlated with the degree of resistance shown by the plants to the invading parasite.

Outstanding resistance was generally manifested by plants with deficient supplies of phosphoric acid or nitrogen, with the exception of potatoes, which were more susceptible to *P. infestans* in the absence of nitrogen. Infection was favoured as a rule by excessive applications of all the constituents (tested in the case of tomatoes only), by a superfluity of nitrogen, and by deficiency of potash. Plants receiving an excess of phosphoric acid or potash frequently proved less susceptible than normally nourished plants to attacks occurring after the close of the main vegetative period, and shortly before earing in the case of cereals. In the early stages, on the other hand, there was no difference in the degree of susceptibility to infection between normally and excessively nourished plants.

From the point at which distinct variations in development, and consequently in reaction to infection, became manifest, the differently nourished plants maintained a constant degree of resistance or susceptibility to their fungous parasites throughout the vegetative period, except in the case of *P. infestans* on potato. Here the decisive factor is a certain degree of maturity which can be accelerated or retarded by the nutrition of the host [*R.A.M.*, vi, p. 47].

The mode of reaction expressed in an alteration of the type of infection, which was most clearly shown on tomatoes in the varying colour of the mycelium, shows that modifications in the nutriment of the host change not only the quantity, but also the quality of the food supply for the parasite.

The somewhat greater resistance of the plants receiving an excess of phosphoric acid or potash is mainly due to the deficiency of nitrogen induced by this combination of nutrient materials, since excessive applications of these constituents altogether failed to increase resistance in the presence of a correspondingly increased supply of nitrogen.

Any combination of nutrients inducing a definite scarcity of nitrogen or phosphoric acid arrests fungous growth (except in the case of *P. infestans* on potato when nitrogen is absent). Conversely, the parasites investigated in these studies find the most favourable conditions for their development in plants receiving a sufficiency of these two nutrients.

CALDIS (P. D.) & COONS (G. H.). **Achromatic variations in pathogenic fungi.**—*Papers Michigan Acad. of Science, Arts and Letters*, vi, pp. 189–236, 11 pl., 3 figs., 1927.

This investigation was made with a view to establishing the factors that govern the appearance of white variants which occur in the form of 'islands' in pure cultures of certain chromogenous pathogenic fungi. The species chosen for intensive study were

Sphaeropsis malorum [*Physalospora cydoniae*], *Colletotrichum lindemuthianum*, *Cladosporium fulvum*, and *Septoria apii*, white variants of which were isolated from single-spore cultures. When grown on various media the variants of *S. malorum* and *S. apii* rapidly reverted to type, and no further work was therefore possible with them. From the other two fungi strains were obtained which retained their characteristics (albinism and lack of sporulation) on artificial media for over two years. Tests made to ascertain the effect, both on the parent and the variant strains, of various nutrients, light, and hydrogen-ion concentration in the substratum, indicated they are not the controlling factors leading to the production of the variants, which remained constant under a wide range of environmental conditions. The variant forms also retained their pathogenicity in regard to their hosts; it is pointed out, however, that the symptoms caused by the *C. fulvum* variant on tomato differed somewhat from those caused by the parent strain. All the variants eventually regained the colour of their parent forms, but not the capacity for spore production.

The authors consider these variants not as definite mutants but as modified forms whose behaviour is analogous to that of 'Abkultur' of *Fusarium* and of the so-called attenuated cultures of fungi and bacteria. They are considered to differ from the parent form somatically rather than genetically.

ANGERMEIER (L.). **Abbauerscheinungen bei der Kartoffel.** [Degeneration phenomena in the Potato.]—*Illus. Landw. Zeit.*, xlvii, 10, pp. 132–133, 1927.

The problem of degeneration in potatoes is discussed in general terms with special reference to German conditions. Heavy, close clay soils are particularly favourable to degeneration, and under such conditions it may be necessary to procure fresh seed at intervals from a healthy locality. The Industrie variety is reported to degenerate in the first year at Bonn and in two or three years on the Lower Rhine, while in various parts of the Eifel [Rhine Province] it remains healthy for ten years or longer. In exceptional cases excellent varieties may be developed on clay soils and retain their vitality for many years under adverse conditions. For instance, the well-known Cimbal selections, Silesia and Wohltmann, originated on heavy soil in a damp climate.

JACZEWSKI (A. A.). Практические мероприятия по борьбе с болезнями Вырождения Картофеля. [Practical measures for the control of degeneration diseases of the Potato.]—*La Défense des Plantes*, Leningrad, iv, 1, pp. 62–77, 1927.

In the introductory part of the present paper the author reviews the various existing theories in regard to the so-called degeneration or virus diseases of plants, with special reference to the potato, and discusses their relative economic importance in various parts of the world. The types of degeneration diseases of the potato so far recorded in Russia are listed as follows, in the decreasing order of their spread and severity in the country: mild mosaic, rugose mosaic, leaf roll, curly dwarf, stipple streak, aucuba mosaic, spindle tuber and 'filosité', witches' broom, marginal leaf roll, and leaf rolling mosaic.

Noteworthy is the fact that all these diseases are for the most part prevalent in the regions of Russia where foreign varieties have been imported for cultivation, such varieties being generally much more susceptible than the native ones; the central provinces of the country are still comparatively free from them. Control work in Russia is still in its infancy, and the main purpose of the paper is to outline measures for the breeding and certification of healthy seed in northern nurseries, a list of which is given. The measures are much on the lines of those already practised abroad.

WHITEHEAD (T.). **Experiments on the control of Potato leaf-roll.**—*Welsh Journ. of Agric.*, iii, pp. 169–180, 1 pl., 2 diags., 1927.

The writer has continued his experiments on the control of leaf roll of potatoes in the field [*R.A.M.*, iii, p. 736]. It was ascertained by tests with the Kerr's Pink, Great Scot, Tinwald Perfection, and Arran Comrade varieties, that the roguing out of infected plants is only likely to prove valuable in slightly infected stocks, and in areas where the transmission of the disease is slow [ibid., iv, p. 434]. No evidence was obtained in support of Schultz's and Folsom's view (*Journ. Agric. Res.*, xxi, p. 77, 1921) that the health of the crop is improved by the selection of large tubers or those from the most vigorous plants, for seed purposes. On the contrary, there was some indication that smaller tubers, from less vigorous healthy plants, produced the soundest crop in the following year. Evidence is adduced showing that there is little risk of perpetuating the disease by the seed if the tubers are lifted by the middle of August, provided the crop is only slightly infected and growing in an exposed situation, and that the tubers are selected from healthy plants at a safe distance from diseased individuals.

SCHLUMBERGER [O.]. **Die wirtschaftliche Bedeutung des Kartoffelschorfes. Ziele und Wege zu seiner Bekämpfung.** [The economic importance of Potato scab. Objects and methods of its control.]—*Illus. Landw. Zeit.*, xlvii, 10, pp. 131–132, 4 figs. (on pp. 129–130), 1927.

The economic importance of potato scab [*Actinomyces scabies*: see also *R.A.M.*, vi, p. 179] is believed to be largely underestimated by German agriculturists. Losses of 10 per cent. and above are stated to be of common occurrence on the market as a result of scab infection, and the waste in peeling may amount to 24 per cent. or more of the tuber weight in susceptible varieties.

Recent experiments at the Münster Agricultural Experiment Station have shown that even susceptible varieties, e.g., Beseler and Industrie, do not contract infection on soils having a P_H value of 3·90 to 4·80, whereas at P_H 6·20 and above the disease occurs on both varieties in a severe form. In damp seasons, such as that of 1926, scab is less prevalent than under dry conditions, the strictly aerobic character of the causal organism precluding its development in badly aerated soils.

Disinfection of the tubers with corrosive sublimate, which is widely practised in America for the control of scab [ibid., v, p. 447],

has not been adopted to any extent in Germany. Owing to the ubiquity of the causal organism in the soil, this method of control is not regarded as promising. On the other hand, the development of highly resistant varieties, such as Jubel, Hindenburg, Belladonna, Gertrud, Imperator, and Wohltmann (all tested by the German Potato Cultivation Station), is considered likely to give satisfactory results. In the author's recent experiments 15 additional varieties, including Moltke, Kuckuck, Arnica, Juli, Parnassia, and Böhm's Erfolg, proved resistant, while Prof. Gerlach, which was resistant at the Potato Cultivation Station, showed great susceptibility. Nine other varieties, including Daber, Alma, Königsniere, President Kruger, and Roode Star, were also extremely susceptible.

PERRET (C.). **Quelques remarques à propos du mildiou de la Pomme de terre.** [Some notes on the Potato mildew.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 1, pp. 30–33, 1927.

The author states that although, generally speaking, the indications are that the intensity and severity of late blight (*Phytophthora infestans*) of the potato are on the decrease, in some regions, e.g., in the department of Saône-et-Loire, the disease is still a very serious economic factor. In discussing control measures, he considers that hilling up the earth around the plants, or sowing the seed somewhat deeper in the soil, tends to retard the infection of the tubers. He further states that in the Loire basin there exist areas where late blight is endemic, recurring every year with more or less intensity. For the most part these are at an altitude of 400 m. along the banks of the Loire and its tributaries, and infection appears to spread from them to higher altitudes. In 1926 potato crops in the Forez plains suffered during the summer from three distinct attacks of the disease, while on the mountains there occurred but a single, late attack, which varied in intensity at different altitudes. On hills from 700 to 800 m. high the foliage only showed a few scattered spots, from 900 to 1,000 m. there were a few foci of heavier infection, while at altitudes from 1,100 to 1,200 m. the infection was general and severe. It was also noted that at these latter heights, crops lying to the leeward of hedges were free from infection to a distance of 10 to 12 m.

MOORE (H. C.). **Hollow heart in Potatoes.**—*Papers Michigan Acad. of Science, Arts and Letters*, vi, pp. 289–294, 1927.

This is a reprint of the author's paper already noticed from another source [*R.A.M.*, v, p. 516].

MITCHELL (J.). **Brown bast of Rubber and its treatment.**—*Malayan Tin and Rubber Journ.*, xvi, 7, pp. 409–411, 1927.

Notes are given on the three methods of treatment in use against brown bast of rubber, viz. stripping, scraping [*R.A.M.*, i, pp. 140, 144], and isolation [ibid., iv, p. 766 *et passim*]. A combined scraping and isolation method has proved most successful under Ceylon conditions, and its general adoption is strongly recommended until such time as isolation proper can be practised by expert operators

on all early cases of the disease as part of the ordinary estate routine [ibid., v, p. 580].

MITCHELL (J.). **Organizing Secretary's Report on visits to estates.** —*Fifth Rept. Exec. Ctte. Rubber Res. Scheme (Ceylon). Proc. during the year 1926*, pp. 8–10, 1927.

Visits were paid to 65 estates in the rubber-growing districts of Ceylon during 1926.

Fomes lignosus now appears to be completely under control as the result of suitable treatment. *F. lamaoensis* was prevalent but caused little damage. *Ustulina zonata* is still widespread, and very few estates have adopted the method of filling the cavities produced by this disease advocated by the Mycologist to the Scheme [*R.A.M.*, v, p. 691]. The practice of cleaning up the base of the trees has led to the discovery of many early developments.

Poria hypobrunnea, Sphaerostilbe repens, and *Xylaria thwaitesii* are of little importance under Ceylon conditions.

A considerable amount of defoliation occurred in the Kalutara and Kelani Valley districts as the result of the secondary leaf fall and pod disease [*Phytophthora ? meadii*], but there are undoubted indications that the revival of manuring has led to an improvement in the health of the trees in many areas [ibid., v, p. 692]. Reports on the results of spraying for the control of leaf fall [loc. cit.] are uniformly disappointing.

Black stripe canker or bark rot [*Phytophthora* sp.] is now well controlled on most estates. As a result of the Mycologist's researches, growers are advised to apply cargillineum every ten days to the portion of the bark tapped during that period, in addition to the preventive painting with water-soluble disinfectants after every tapping [ibid., vi, p. 254]. Where the disease has developed, tapping should be discontinued for one or two months according to weather conditions. For the first time during the past four years the occurrence of black stripe has been reported from the Uva district, following the north-east monsoon of 1925.

The incidence of patch canker [*P. faberi*: ibid., v, pp. 580, 581] is stated to be steadily decreasing in Ceylon.

There are very definite indications that brown bast [loc. cit. and preceding abstract] is again on the increase, especially in the Kurunegala, Matale, and Uva districts.

Only one estate reported a recurrence of *Oidium* leaf fall [*O. heveae*] during 1926.

Paranitrophenol [ibid., v, p. 694] has proved entirely satisfactory in the elimination of mould on sheet rubber.

Sweden: Legislative and administrative measures.—*Internat. Rev. Sci. & Pract. Agric.*, N.S., xviii, 2, p. T 124, 1927.

A Decree effective from 1st January, 1927, No. 497, which supersedes that of 12th September, 1921, No. 532 [*R.A.M.*, iv, p. 256], contains modifications in the provisions regarding the importation of potatoes into Sweden. Certificates are required with the consignments specifying that they are free from wart disease (*Synchytrium endobioticum*), and that the disease does not exist in the

exporting country, nor has it appeared there within the six years preceding the issue of the certificate.

NEUWEILER (E.). **Switzerland: Outbreak of wart disease.**—*Internat. Rev. Sci. & Pract. Agric.*, N.S., xviii, 2, pp. T 118-T 119, 1927.

In 1925 the wart disease of potatoes (*Synchytrium endobioticum*) was observed in eleven communes of the cantons of Lucerne, Basle, and Aargau in Switzerland [*R.A.M.*, v, p. 627], but a drastic check on imports succeeded in preventing any further spread of the disease in the following year. An official Order of 20th January, 1926, forbade the importation of potatoes from 1st February, 1926, till the end of the planting season, i. e., the end of May, but special permission was granted by the Federal Department of Public Economy in cases where the necessity was indisputable, a guarantee of health being required.

Only in one case did the disease reappear in 1926, at Ruswil (Lucerne), where the regulations had been neglected and potatoes planted in a field immediately beside a field infected in 1925. A new outbreak at Rümikon (Aargau) in 1926 is attributed to infected seed. An isolated case was reported in Thal (St. Gall) and wart disease has also made its appearance in Lustenau (Vorarlberg).

The Plant Pest and Disease Ordinances, 1921 and 1923. Plant Pest and Disease (Import) Regulations, 1927.—Tanganyika Territory, Govt. Notice No. 39, 1 p., 1927.

By an order of 29th March, 1927 (which may be cited as the Plant Pest and Disease (Import) Regulations, 1927), the first schedule of the Plant Pest and Disease (Import) Regulations, 1923 [prohibiting the importation into the Territory of all living plants and certain seeds except by special permit: *R.A.M.*, iii, p. 240], is extended to include tobacco seed.

The Plant Pest and Disease Ordinances, 1921 and 1923. Plant Pest and Disease (Import) (No. 2) Regulations, 1927.—Tanganyika Territory, Govt. Notice No. 62, 1 p., 1927.

By an order of 28th April, 1927 (which may be cited as the Plant Pest and Disease (Import) (No. 2) Regulations, 1927), the first schedule of the Plant Pest and Disease (Import) Regulations, 1923 [see preceding abstract], is extended to include the following seeds: tea from India, Formosa, and Japan; Pará rubber [*Hevea brasiliensis*] from South and Central America and the West Indies; coco-nuts from South and Central America and the Lesser Antilles; cacao from South America and West Africa; and groundnuts from India.

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STOUGHTON-HARRIS (R. H.). **The influence of the reaction and the concentration of the medium on the growth of Phytophthora faberi in artificial culture.**—*Third Quart. Circ. for 1926, Rubber Res. Scheme (Ceylon)*, pp. 5–6, 1926.

Further experiments were carried out to test the effect of the reaction and concentration of the media (Coons's and Richards's solutions) on the growth of *Phytophthora faberi* [*R.A.M.*, v, p. 581]. At P_H concentrations round about neutrality (P_H 7·0) or slightly acid, the rate of growth of the fungus was constant, but it diminished on a strongly acid medium. The maximum development occurred at P_H 6·2. The P_H value of rubber bark lies between 6·2 and 6·4, so that *P. faberi* is well adapted to parasitic growth on this host. Possibly the beneficial effects of manuring on the control of secondary leaf fall [*R.A.M.*, vi, p. 575] are due to increased acidity in the cell sap of the tree, which renders it less suitable to the growth of the fungus. The maximum growth of *P. faberi* on Richards's solution with 2 per cent. agar occurred at a strength of one-fifth normal, but the rate of development was practically unaffected by concentrations ranging between twice normal and one-hundredth normal.

STOUGHTON-HARRIS (R. H.). **Mycologist's report for 1926.**—*Fifth Rept. Exec. Ctte. Rubber Res. Scheme (Ceylon). Proc. during the year 1926*, pp. 18–19, 1927.

Continuing his experiments on the value of disinfectants in inhibiting the development of *Phytophthora faberi* [*R.A.M.*, v, p. 581], the writer found the following effective inhibiting concentrations: dinitrophenol, 0·005 per cent.; paracresol, 0·04 per cent.; metacresol, 0·06 per cent.; orthocresol, 0·07 per cent.; 25, 15, and 5 per cent. tar acids, 0·10, 0·15, and 0·25 per cent., respectively.

These data show that the cresols and higher concentrations of tar acid derivatives have a greater fungicidal efficacy than the various proprietary mixtures on the market.

STOUGHTON-HARRIS (R. H.). **Natural immunity of Rubber trees to bark rot.**—*Trop. Agriculturist*, lxviii, 3, pp. 143–145, 1927.

In this paper experimental evidence is given bearing on the theory that the same rubber trees which are infected with bark rot [*Phytophthora* sp.: *R.A.M.*, v, pp. 580, 581] one year, tend to be reinfected the next year, while those not previously attacked tend to remain free. It was found by actual observation and calculation, in a plot of 1,440 trees, arranged in 18 sets, representing 18 different treatments, that 50 more trees were attacked in both the years 1925 and 1926 than would have been expected if all trees were equally susceptible. Similarly there were 50 fewer new cases (that is, trees attacked in 1926 that were healthy in 1925) than would have been expected. This discrepancy between the observed and the expected distribution of the disease was found in all sets of trees and is to be accounted for, according to the author, by the immunity from, or at least the greater resistance to, the infection shown by certain trees.

S'JACOB (J. C.). **Anorganische beschadigingen bij Pisum sativum L. en Phaseolus vulgaris L.** [Inorganic injuries of *Pisum sativum* L. and *Phaseolus vulgaris* L.]—Thesis, University of Utrecht, ix + 117 pp., 8 pl., 4 graphs, 1927.

In this account of an investigation, by means of water cultures, on the effect of various fertilizers on the growth of peas and beans, with reference to the physiological diseases occurring in recent years in Holland and Germany, the author states that the pathological symptoms associated with acid and alkaline soils are not the same as those occurring in the Hooghalen (soil acidity) and the Veenkoloniale (grey speck) diseases [*R.A.M.*, vi, p. 51], in which, however, soil reaction is probably a very important contributory factor. It has been observed that the Leguminosae and Gramineae react very differently to these soil diseases, and the author considers that this reaction can be explained by a difference in the action of the fertilizer. Peas are more severely attacked by the soil acidity disease than oats because they are much more susceptible to an acid medium and because the acid reaction produced by applications of ammonium sulphate is more intense in soil planted with peas than in that with oats. In the Veenkoloniale disease of oats the case is exactly reversed.

Lime has a much more favourable effect on peas affected by the Hooghalen disease than on oats. This is often attributed to the alteration of soil reaction, but the favourable nutrient action of calcium also probably plays a part, especially in the case of very large applications. Peas and beans were found to be very susceptible to the presence of nitrites, much more so than oats.

The author's experiments are considered to have disproved the view that the Hooghalen and Veenkoloniale diseases are due to a direct influence of the reaction of the soil and he considers that Hiltner's carbonic acid-mineral substance theory [*R.A.M.*, v, p. 732]

of the latter disease cannot be maintained in view of Hudig's and Meyer's work. The tolerance of oats for nitrites tells against Aberson's view that the action of nitrite-forming bacteria is the direct cause of grey speck. Hudig's and Meyer's view that these diseases are due to an indirect action of unsuitable (physiologically acid or alkaline) fertilizers is regarded as most probably the correct one. A full bibliography is appended.

HARRIS (R. V.). **A wilt disease of Hops.**—*Ann. Rept. East Malling Res. Stat. 1925, II Supplement*, pp. 92–93, 1927.

In 1924 and 1925 the writer investigated a disease of Fuggles hops at Penshurst, characterized by the wilting and yellowing of one or more bines of the affected hill before or during the ripening of the cones. The infected bines were readily detached from the crowns, the tissues of which were rotted and discoloured. This condition, which involved some 40 per cent. of the bines in the Penshurst gardens, differed in several respects from canker [*R.A.M.*, ii, p. 132], notably in the absence of *Fusarium* pustules on the bark.

A species of *Verticillium*, which was constantly isolated from the discoloured wood, is believed to be responsible for the wilt, though inoculation experiments have hitherto given negative results.

All badly affected hills should be dug up and burnt and all bines cut and destroyed as soon after picking as possible, instead of being used as green manure.

DASTUR (J. F.). **A short note on the foot-rot disease of Pan in the Central Provinces.**—*Agric. Journ. of India*, xxii, 2, pp. 105–108, 1927.

The author describes in popular terms the symptoms and course of infection of a disease which of late years has proved seriously injurious to 'pan' (*Piper betle*) in the Central Provinces of India, and the causal agent of which has been found to be a species of *Phytophthora* [*R.A.M.*, v, p. 594]. The disease decreases in virulence in winter and practically disappears in the hot season, being at its maximum during the rains. Affected plants droop, the upper succulent parts of the vines wilting as if from want of water. The green parts then turn pale yellow and later brown, the leaves shrivel, and the plant dies. The basal part is rotten and can be easily pulled out owing to destruction of the roots. The dead parts of the vines bear black and bristly or pink and oily spots which are the acervuli of the *Colletotrichum* and *Gloeosporium* stages of *Glomerella cingulata*, the perfect stage of this fungus having been found both in cultures and on the dead plants. Neither this nor *Rhizoctonia destruens* [*Sclerotium rolfsii*] which also occurs on diseased plants is, however, considered to be the chief cause of the disease. Examination of recently affected tissues at the base of the plant shows the presence of uniseptate hyphae of a Phycomycete, which attacks at or just below ground level, causing a brown discoloration surrounded by a water soaked area. At a later stage the infected tissues turn black. Infection does not extend more than a few inches above the soil level, except in cases where the upper parts hang down and come in contact with the ground.

The organism has been isolated in pure culture and proved to be a *Phytophthora* with oospores similar to those of *P. parasitica*. Sporangia are rather sparingly formed and have, so far, only been observed to germinate by germ-tubes, not by zoospores. Inoculations of rooted plants in pots have been successful in reproducing the disease.

The control measures suggested include the application of fungicides to the base of the plants and the surrounding soil; improved ventilation by partially removing the shelters under which the vines are grown during the monsoon season; the avoidance of water logging in the gardens; the restriction of fertilizers; and proper supporting of the vines so that they are kept from touching the soil.

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Hongos parásitos y saprofitos de la República Dominicana. (9ª Serie.).** [Parasitic and saprophytic fungi of the Dominican Republic. (9th Series.)] —*Bol. R. Soc. Española Hist. Nat*, xxvii, 2, pp. 68–81, 16 figs., 1927. **Ibid. (10ª Serie).**—*ibid.*, 4, pp. 165–177, 7 figs., 1927.

In the 9th series of descriptions of Dominican fungi [*R.A.M.*, vi, p. 321], the writers record the occurrence of *Uredo eichhorniae* n. sp. ad int. on leaves of *Eichhornia crassipes*, the water hyacinth. This species is characterized by bright yellow or brown, globose, subglobose, or oval uredospores, measuring 22 to 26 by 21 to 24 μ, with 3 to 5 germ-pores, and by numerous linear or claviform, curved paraphyses. *Diplodia mangiferae* was found on branches of mango trees. *Leptostroma colae* n. sp. ad int. produced large, irregular, ill-defined spots on living leaves of *Cola vera*. This species is characterized by black, globose pycnidia, measuring up to 150 μ, and by hyaline, cylindrical spores, 5 to 6·5 by 2 to 2·5 μ, with two guttulae in the attenuated or obtuse ends. *Colletotrichum anonicola* occurred on living leaves of *Anona muricata*. *Botrytis vulgaris* was found on fallen petioles and fruits of the royal palm (*Roystonea regia*).

In the 10th series the following are some of the records. *Phyllosticta musae-sapientii* n. sp. ad int. was found in association with *Sphaerella musae* on withered or dry banana leaves. The hyaline, cylindrical or sub-bacilliform, straight or slightly curved spores measure 3 to 4·5 by 1 to 1·3 μ. *P. anonae* was found on living leaves of *Anona muricata*, which is stated to be a new host. *P. panici-maximi* n. sp. ad int. occurred on dry leaves of Guinea grass (*Panicum maximum*). Its pycnidia are 76 to 100 μ in diameter, and its hyaline, cylindrical-fusoid, obtuse, straight or slightly curved spores 5 to 6 by 1·5 to 2 μ. *Leptothyrium musae* n.sp. ad int., which is characterized by scutiform or oblong, erumpent, sessile pycnidia and numerous hyaline, oval or elongated spores, measuring 4·5 by 1·2 to 1·4 μ, occurred on dry leaves of *M. paradisiaca*. *Swietenia mahagoni* was attacked by *Pestalozzia swieteniae* n. sp. ad int., which produced large, irregular, marginal or apical, reddish (later grey) lesions on the leaves, and is characterized by subfusoid conidia, measuring 22 by 5 to 7·5 μ, with 5 or 6 cells, the middle ones being

uniformly dark, and having 3 setae up to 17 μ in length. *Cercospora cajani* was found on living leaves of *Cajanus indicus*.

VAN HOOK (J. M.). **Indiana fungi.—IX.**—*Proc. Indiana Acad. Sci.*, xxxv (*1925*), pp. 233–236, 1926. [Received 1927.]

The following are some of the fungi not previously recorded in Indiana, or occurring on new hosts, which the author has recently observed. White rot [downy mildew] of the vine (*Plasmopara viticola*) caused a severe rotting of blue autumn grapes in August, 1924. *Phyllosticta liriodendrica* was found on living leaves of *Liriodendron tulipifera* in 1923. *P. paviae* (*Guignardia aesculi*) killed all the leaves on many young bushes of *Aesculus glabra* in May, 1925. *P. prunicola* caused a very extensive and severe spotting of the leaves of *Prunus serotina*. *Septoria ribis* occurred on living gooseberry leaves in August, 1924. *Gloeosporium caryae* was unusually severe on living leaves of *Carya alba* in August, 1925. *Quercus robur* was attacked by *Marssonia* [*Marssonina*] *martini* in June, 1925. *Piricularia grisea* was found on living leaves of *Syntherisma sanguinalis* [*Panicum sanguinale*] in August, 1925.

HAWKINS (S.). **Some Xylarias of Indiana.**—*Proc. Indiana Acad. Sci.*, xxxv (*1925*), pp. 225–229, 1926. [Received 1927.]

A brief account is given of the world distribution of the genus *Xylaria* and of the occurrence of certain species in the United States. *X. polymorpha*, *X. hypoxylon*, and *X. digitata* have been reported to cause severe damage to apple orchards from Virginia to Illinois. The characters of these species are concisely summarized with references to the work of previous investigators, and a key to the species is given.

CHARDON (C. E.). **La revolución de las variedades de la Caña en Puerto Rico.** [The revolution in sugar-cane varieties in Porto Rico.]—*Rev. Agric. Puerto Rico*, xviii, 3, pp. 117–127, 2 figs., 2 graphs, 1 map, 1927.

After a brief review of the sugar-cane situation in Porto Rico and of the factors influencing production, an account is given of the first appearance in 1915 and the subsequent spread of yellow stripe or mosaic disease throughout the island, where it has caused very serious losses in all the infected areas.

In 1918 a thorough investigation was started in order to discover the conditions favouring attack and the varieties susceptible to the disease. As a result, new varieties have been introduced in substitution for the old non-resistant varieties, and in conjunction with improved cultural conditions, this has led to a marked improvement in the crop. This is evident in the increased production, which is shown by means of graphs and tables. The resistance of the Uba cane to mosaic led to extensive tests of this variety, but other canes of better quality are now to a large extent replacing it. Amongst these very satisfactory yields are stated to have been given by the two Barbados canes, B.H. 10 (12) and S.C. 12 (4), though both are susceptible to mosaic and their extended cultivation may constitute a serious problem in the future.

GADD (C. H.). **Report of the Mycologist.**—*Ann. Rept. Tea Res. Inst. of Ceylon for the year 1926* (*Bull.* 1), pp. 7–15, 1927.

The investigations described in this report cover the period from 1st July to 31st December, 1926. *Cercosporella theae* is stated to be undoubtedly the most serious leaf disease of tea in Ceylon at present [*R.A.M.*, ii, p. 294]. It occurs only during wet weather and stops with the cessation of the monsoon rains. In culture *C. theae* produces perithecia and ascospores, which are as yet unknown in nature. The ascospores have been shown to cause the typical symptoms of the *Cercosporella* leaf disease on tea, acacias, and *Albizzia lopantha*. It was hoped that the last-named might be used to replace acacias for interplanting with tea, but the writer's experiments have shown that it is highly susceptible to the leaf disease. Probably the fungus is able to survive the dry periods in the perithecial stage.

The writer has investigated a disease which in many respects resembles witches' broom [ibid., iv, p. 637], from which it differs, however, in the absence of tufts of shoots. The most noticeable feature of the condition is a yellow discoloration, preceded by mottling, of the leaves. Small shoots with crowded internodes, bearing small leaves at the apex, are also present. Fully grown stems produce branches, more or less in one plane, at every node. On certain shoots every bud begins to grow shortly after formation, whereas in normal cases a large number remain dormant. This abnormal branching may occur without any yellowing of the leaves. It is thought that the disease described as witches' broom may include three distinct conditions, tufted branches representing one, yellow and stunted leaves the second, and abnormal branching the third. The term 'chlorosis' is suggested for the second of these conditions. Chlorosis occurs in fairly well-defined areas and results in a great diminution of the crop, with the death of a large proportion of the bushes. No organism has been found consistently associated with the disease, and the cause is ascribed to physiological factors, probably connected with the soil. The chlorotic condition seldom appears until the bushes are fully matured, and its spread, if any, is very slow. Experiments showed that starch was removed quite as readily from diseased as from healthy leaves, indicating the absence of any appreciable degree of phloem necrosis, and suggesting that the disease is not a true mosaic. The sap of diseased stems is markedly less acid than that of healthy plants.

One of the major pathological problems in Ceylon is the rotting back of the wood exposed by pruning, for which various fungi are probably responsible in different districts. Washed tar is preferable to ordinary coal tar for application to pruning cuts or wounds on tea bushes.

TUNSTALL (A. C.). **An outbreak of blister blight in the Surma Valley.**—*Quart. Journ. Indian Tea Assoc., 1927*, 1, pp. 20–24, 1927.

During the cold weather of 1926–7 specimens of blister blight of tea (*Exobasidium vexans*) were received for the first time from the Surma Valley of north-eastern India. At the time of the outbreak (early December) the prevailing winds in the affected areas

were north or east, and it is thought that the spores of the fungus were borne by these winds to the plantations on the west of the valleys concerned, those on the east remaining uninfected. Possibly the wild *Camellia drupifera*, which is present in the hills between the Surma and Assam Valleys, may have become infected from tea in the latter and acted as an agent of transmission. It is improbable that the disease was carried all the way from the previously infected areas in the Assam Valley or Darjeeling by the wind, nor was any evidence of its introduction on tea seed obtained. Owing to the high temperatures normally prevailing in the Surma Valley during the rains, it is considered unlikely that the fungus will cause very severe damage [*R.A.M.*, vi, p. 2]. Brief notes are given on the life-history of *E. vexans*, with directions for its control.

MOORE (ENID S.). **Mosaic of Virginian Tobacco.**—*Farming in South Africa*, i, 12, pp. 450-452, 3 figs., 1927.

This article reports inquiries made during the last three seasons regarding a brown spotting of the leaves of Virginian tobacco suffering from mosaic in South Africa [*R.A.M.*, vi, p. 131]. The affected leaves turn yellow in patches. Later small, brown, scattered spots appear and run together to form large, irregular scorched areas. The author believes this to be a sun scorch to which the mosaic plants are particularly susceptible because of the unhealthy condition of their green cells. These scorched plants are usually smaller than the healthy ones. In an experiment 12 healthy plants inoculated at transplanting with juice from a mosaic leaf, developed mosaic and sun scorch symptoms, while 12 uninoculated plants in the next row remained healthy. The article includes some remarks on the commercial inferiority of mosaic and sun scorched leaves, and on the nature of mosaic diseases, their cause, methods of spread by handling and aphids, and the desirability of discovering means of protecting the seed-bed against infection.

BERG (A.). **Tomato late blight and its relation to late blight of Potato.**—*West Virginia Agric. Exper. Stat. Bull.* 205, 31 pp., 7 figs., 1926. [Received July, 1927.]

The results of a five years' series of inoculation experiments [full particulars of which are given] are stated to show that the form of *Phytophthora infestans* producing late blight of tomatoes differs biologically from that causing the late blight of potatoes. This statement applies both to American and foreign strains of the fungus.

P. infestans from the potato infects tomato fruit and leaves under artificial conditions, producing numerous small lesions on the older leaves, but the fungus soon dies and the plants recover. Tomato fruits could only be infected by this strain after the rupture of the epidermis.

The period of incubation for the potato strain, when inoculated on tomato plants, is shorter than that of the tomato strain on the same host, and vice versa. In all the cases observed under natural

conditions, late blight of potatoes appeared earlier in the season than that of tomatoes.

The Australian kangaroo apple (*Solanum aviculare*) was found to be equally susceptible to infection by both strains of the fungus under natural conditions.

Both the tomato and potato strains of *P. infestans* were found to grow on a medium of much higher acid content (oatmeal agar with varying concentrations of citric, lactic, and malic acids) than that of the tomato fruit or stem. The growth of the tomato strain is inhibited to a much greater degree than that from the potato by the use of blight-resistant or long stored potato tubers as a medium. *P. infestans* from potato tends to produce deformed sporangia on tomato tissue. Considerable divergence as regards sporangial production and vegetative growth has been observed in the behaviour of the two strains in culture.

Oospore-like bodies were frequently observed in Australian and other potato and tomato strains of *P. infestans*. The writer believes that these bodies are abortive and functionless oospores. Mature oospores with well-defined amphigynous antheridia have occasionally been detected in cultures of Australian, Dutch, and English strains of the fungus on quaker oats.

JONES (H. L.). **Manurial and stripe disease control experiment on Tomatoes, Rhyl.**—*Welsh Journ. of Agric.*, iii, pp. 296–297, 1927.

A series of experiments was conducted [in 1926] to ascertain the effect of various manurial treatments on the incidence of stripe disease of tomatoes [*Bacillus lathyri*], which is stated to be very troublesome in the Rhyl district of Flintshire. Complete control was given by the application of ¼ lb. each of bone meal, bone flour, and sulphate of potash, 1 lb. lime, and 14 lb. stable manure per sq. yd., with a top-dressing, at fortnightly intervals, of sulphate of potash at the rate of 2 oz. per sq. yd. In a plot fertilized with 14 lb. stable manure and 1 lb. superphosphate, and receiving a top-dressing of nitrogenous manure (the usual treatment in the district), the disease was prevalent. In two other plots receiving potash as a constituent of the fertilizer there was only a trace of infection. It may safely be concluded, therefore, that the application of potash practically eliminates stripe in tomatoes [cf. *R.A.M.*, iii, p. 197; iv, p. 69].

ATIENZA (M.). **Sclerotium disease of Tomato and Pepper.**—*Philipp. Agric.*, xv, 10, pp. 579–588, 2 pl., 1 fig., 1927.

Tomatoes and chilli pepper (*Capsicum annuum*) are commonly attacked at the Los Baños (Philippine Islands) College of Agriculture by *Sclerotium rolfsii*, which causes damping-off of the seedlings and produces oval, elliptical, oblong, or irregular, water soaked lesions on the fruits and stems. The diseased areas later become covered with a white mycelium which gives rise to sclerotia. These are the chief sources of inoculum in the field, and it has been found that infection may be largely prevented by burying them at a depth of 2 cm. below soil-level. The sclerotia vary in size and number on different media and also on tomato and pepper. The

discrepancies, however, are not considered sufficient to justify the separation of the strains on these two hosts into distinct species.

Inoculation experiments on wounded and unwounded tomato, pepper, soy-bean [*Glycine hispida*], velvet bean [*Stizolobium deeringianum*], groundnut, and eggplant gave positive results. Fruits of watermelon, upo (*Lagenaria leucantha*), chilli, and tomato were successfully inoculated in the laboratory and the two last-named in the field also. Under the latter conditions the growth of the fungus was much slower and the sclerotia fewer and smaller than in the laboratory.

Good control of the disease on a small scale was given by disinfection of the soil with lime (3 per cent. by weight), sulphur (2·66 to 3·33 per cent. by weight), copper stearate (0·8 per cent. by weight), 0·5 per cent corona 640, or 1 per cent. uspulun.

GRAVES (A. H.). **Forest Pathology.**—*Sixteenth Ann. Rept. Brooklyn Bot. Gard., 1926* (*Brooklyn Bot. Gard. Record*, xvi, 2), pp. 45–48, 1927.

During the last six years black or sweet birches (*Betula lenta*) in Greater New York and northwards have suffered severely from *Nectria* canker (*Creonectria coccinea*), which produces rough areas on the bark of the trunk and branches. Typical cankers appear as deep pits, lined with successively receding concentric rings or ellipses of wood, apparently representing the periods of advance of the fungus in the healthy tissues. The disease progresses slowly and affected trees may live a long time. Small branches or twigs affected by the canker are often considerably swollen. The bright crimson, ovoid fruiting bodies of the fungus, measuring just under 0·5 mm. in diameter, appear during September or October in the crevices of the rough bark bordering the canker. In the summer conidia develop on the surface of the diseased tissue. The paper birch [*B. papyrifera*] and the yellow birch [*B. lutea*] have also been found affected by the *Nectria* canker in Maine and Vermont [*R.A.M.*, vi, p. 446].

The removal of diseased trees, or of their twigs when these only are affected, and the treatment of wounds with ordinary lead paint are recommended.

VAN HOOK (J. M.). **Gloeosporium hysterioideum Dear. & Barth.—a leaf disease of Acer saccharum Marsh.**—*Proc. Indiana Acad. Sci.*, xxxv (*1925*), pp. 232–233, 1926. [Received 1927.]

Since 1920 observations have been made on *Gloeosporium hysterioideum* (*Mycologia*, xvi, p. 167, 1924), which causes the defoliation of sugar maples (*Acer saccharum*) in southern Indiana and elsewhere. Young trees up to 50 ft. in height are chiefly affected and the disease is most prevalent in damp seasons.

The fungus produces on the leaves amphigenous, distinct, reddish-brown, circular or irregular, coalescent spots, 0·5 to 1 cm. in diameter. In dry seasons the lesions are fewer and more regularly circular in outline, with broad yellow margins, becoming paler in the centre, and up to 3 cm. in diameter. In such cases the leaves are not entirely destroyed, as they are by the former type of injury. The numerous acervuli are distinct, epiphyllous, 25 to 500 μ in

diameter (average 100 μ), and the spores are few, 15 to 20 by 12 to 15 μ, hyaline, and pyriform, conoidal, ovate, or almost spherical. Secondary spores are abundantly formed and are hyaline, oblong, and 5 to 10 by 0·5 to 2·5 μ. After August there is scarcely a trace of the primary spores, whereas the bacillary type is extremely numerous at that time. This condition is stated to be similar to that obtaining in the case of *Guignardia aesculi*.

GUYOT (R.). **Mycélium lumineux de l'Armillaire.** [Luminous mycelium of *Armillaria*.]—*Comptes rendus Soc. de Biol.*, xcvi, 2, pp. 114–116, 1927.

Since 1918 the writer has observed an extensive dying-off of oaks, chestnuts, pines, elms, walnuts, poplars, vines, and other trees as the result of infection by *Armillaria mellea* in the forests of the Gironde and the neighbouring departments, and has made some investigations on the well-known luminous properties of the mycelium of this fungus.

Under natural conditions the most vigorous portions of the mycelium are also the most luminous. Suspension of the protoplasmic activity of the mycelium by anaesthetics or antiseptics leads to the temporary or permanent disappearance of luminosity. Radium destroys the cells and prolonged exposure to its action causes the disappearance of luminosity.

The destruction of the mycelium by laceration in water also entails the disappearance of luminosity. The water used for this purpose does not become luminous, as it would if the phenomenon were of bacterial origin, and repeated search failed to reveal any bacteria associated with the mycelium.

White hyphae, luminous in the dark, developed in about a month from hymenial plates on a medium of acorns or chestnuts mixed with agar and water. Typical rhizomorphs also developed on these media: they showed no luminosity. The writer succeeded in reproducing the disease in pine and acacia by applying these rhizomorphs to their roots. The luminous mycelium penetrated the cortex a few months later, causing the death of the tree, and in the autumn the fructifications of the fungus were found at the base.

WIEBEN (MAGDALENE). **Die Infektion, die Myzelüberwinterung und die Kopulation bei Exoasceen.** [Infection, mycelial hibernation, and conjugation in the Exoascaceae.]—*Forsch. auf dem Gebiete der Pflanzenkrankh. u. der Immunität im Pflanzenreich*, iii, pp. 139–176, 32 figs., 1927.

The writer's recent researches on infection, mycelial overwintering, and conjugation in the Exoascaceae are fully described. Inoculation experiments were carried out by Klebahn's method with 'yeast' conidia [*R.A.M.*, iii, p. 108] on *Alnus glutinosa* with *Taphrina tosquinetii* and *T. sadebeckii*; *A. incana* with *T. epiphylla*; *Populus* spp. with *T. aurea*; *Crataegus oxyacantha* with *T. crataegi*; peach with *T. deformans*; and pear with *T. bullata*. Positive results were obtained only with *T. deformans* on the peach and with *T. tosquinetii* and *T. epiphylla* on *A. glutinosa* and *A. incana*, respectively. The mycelium of *T. epiphylla* and *T. betu-*

lina was detected in the covering scales, young leaves, leaf primordia, and vegetation cone of the buds of the witches' brooms formed by these fungi, while that of *T. tosquinetii* occurred only in the covering scales or penetrated very sparingly below the surface. The so-called annual leaf-spotting species (*T. sadebeckii*, *T. bullata*, and *T. aurea*) were also found to overwinter in the outermost leaves of the buds of their respective hosts. The dissemination of these species during the summer is presumably effected by the first mature ascospores produced by the overwintered mycelium.

In the summers of 1924 to 1926 the writer observed a typical *Taphrina* infection on the leaves of *A. incana* near Hamburg. The mycelium occurs between the cuticle and epidermis of greenish- to dirty lemon-yellow, concave areas on the under side of the leaves. The cylindrical asci developing from the ascogenous cells measured 35 to 45 by 15 to 20 μ and contained eight ascospores about 5 μ in diameter. The fungus was determined as a new species of *Taphrina* closely allied to *T. epiphylla* and *T. sadebeckii*, and given the name of *T. klebahni*. A diagnosis in Latin is furnished.

A detailed investigation was made of the cytology of *T. epiphylla* and *T. klebahni*. Conjugation in these species was found to occur between pairs of the oval, uninucleate yeast conidia developing from the uninucleate ascospores, the entire contents of one being transferred to the other. The diploid conidium developing from this fusion forms a germ-tube into which the entire contents of both the original conidia pass. The germ-tube develops into an 'exploring hypha' the apex of which contains the paired nuclei. Fusion of the paired nuclei was not observed and is believed to occur only in the host during ascospore formation. Sexual differentiation was observed in the eight yeast conidial strains isolated from the individual ascospores of a number of asci, four being of one sex and four of the other. Conjugation occurred only between members of the two different sex groups and generally did not take place until the third generation from the ascospore. Direct conjugation between the ascospores was not observed. It is evident from these researches that in the Exoascaceae the diploid phase begins with conjugation and terminates with ascospore formation, while the haploid phase is represented by the ascospores and their progeny, the yeast conidia. The latter phase may persist for years in artificial culture, usually in the form of yeast conidia, but occasionally as germ-tubes or short hyphae, the cells of which, when they arise from unconjugated conidia, are always uninucleate.

EFTIMIU (PANCA) & KHARBUSH (S.). **Recherches histologiques sur les Exobasidiées.** [Histological investigations of Exobasidiaceae.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 1, pp. 62–88, 1 pl., 9 figs., 1927.

The authors have made a detailed investigation of the morphology and cytology of four species of *Exobasidium*, namely, *E. vaccinii myrtilli*, *E. vaccinii uliginosi*, *E. rhododendri*, and *E. discoideum*, and of the histological alterations produced by them in their hosts' tissues. In agreement with other workers they have found that the formation of the basidium in these species is always preceded

by the fusion of two nuclei, the cells of the mycelium in the tissues being mostly binucleate. In dividing, the sexual nucleus thus produced always forms daughter nuclei with two chromosomes each. The spores are uninucleate and the origin of the binuclear stage of the mycelium is not indicated. They have also clearly observed that the vacuoles contained in the basidium pass through the sterigma into the basidiospore; from the latter, at its germination, the vacuoles pass into the germ-tube and the mycelium, without being formed *de novo*. Besides the metachromatic corpuscles and lipoid inclusions in the cytoplasm of the basidia, they claim to have established for the first time the presence of a cytome constituted by numerous cytosomes which are always globular.

In regard to the histological changes produced in the host tissues, they consist in the formation of more or less marked tumours caused by a stimulation of cell division; the various layers of cells in the attacked tissues lose their individuality and become homogeneous, and the figured elements of the cytoplasm are profoundly altered. The invaded cells react by an abundant production of phenolic compounds and of starch, with the exception of *E. vaccinii uliginosi*, which provokes the secretion of fatty substances in the cells, a metabolic phenomenon which was not observed in other Ericaceae parasitized by these fungi.

MAY (C.) & YOUNG (H. C.). **Control of damping-off in coniferous seed beds.**—*Bimonthly Bull. Ohio Agric. Exper. Stat.*, xii, 2, pp. 45–47, 1927.

The results are recorded in this paper of three years' field and greenhouse experiments undertaken to determine the relative value and the best method of application of various preparations for the control of damping-off due to *Pythium de Baryanum* and *Corticium vagum* [*C. solani*] in red pine (*Pinus resinosa*) seedlings [*R.A.M.*, vi, p. 451]. Three per cent. formaldehyde, applied at the rate of 1 quart per 2 sq. ft., proved decidedly superior to any of the other treatments, reducing the incidence of infection from 43 per cent. to nil. Sulform (2·5 and 3 per cent.), 0·25 per cent. uspulun or semesan (1 quart per 1 sq. ft.), and sulphuric acid (1 oz. to a gall. water per 4 sq. ft.) were all less successful, and the last-named impaired germination. Kalimat, abavit, wa-wa dust, and colloidal copper hydroxide failed to control the disease, and sodium silicofluoride and sodium acid fluoride (26, 39, 52, and 78 gm. per sq. ft.) were very injurious to germination and did not eliminate infection. Brief directions are given for the application of the formaldehyde treatment.

HUNTER (LILLIAN M.). **Comparative study of spermagonia of rusts of Abies.**—*Bot. Gaz.*, lxxxiii, 1, pp. 1–23, 4 pl., 2 figs., 1927.

The number of heteroecious rusts found on species of *Abies* is stated to be very large, the aecidial stage alone being present on the firs. All these belong to the form-genus *Peridermium* except the aecidial stages of *Melampsora abietis-capraearum* and *M. americana*. The peridermia are usually very similar and much confusion has resulted from attempts to identify them in this stage. The

spermogonia, however, have been found to possess distinctive characters, and a detailed account of these is given for 12 species from Canada and the United States, all but one of which occur on *Abies balsamea*, out of 21 which have hitherto been recorded on species of *Abies*. A table summarizing the distinctive spermogonial characters of these 12 species is given.

COLLEY (R. H.), HARTLEY (C.), & TAYLOR (MINNIE W.). **A morphologic and biometric comparison of Cronartium ribicola and Cronartium occidentale in the aecial stage.**—*Journ. Agric. Res.*, xxxiv, 6, pp. 511–531, 4 figs., 1 graph, 1927.

From this detailed comparison of the aecidial stages of *Cronartium ribicola* and *C. occidentale* the writers conclude that the morphological differences between the two organisms are sufficient to justify their standing as distinct species. This conclusion agrees with that arrived at in a similar study of the uredo-stages of the same fungi. In general habit the differences shown by the aecidia are marked. In *C. ribicola* they are usually distinct sori with persistent peridia, but in *C. occidentale* they vary from distinct sori, as on *Pinus monophylla*, to broad spore-bearing layers under the bark, with thin, inconspicuous peridia, as on *P. edulis*. The mycelia of the two species are indistinguishable as to width, but the haustoria of *C. ribicola* are longer than those of *C. occidentale*. This may, however, be influenced by the difference in host. The aecidiospores of the latter species are distinctly longer and broader than those of the former; they have a slightly thicker wall, a more irregular outline, and larger and more irregularly distributed tubercles. The peridia of *C. ribicola* are three to five cells thick, with all cells tuberculated; those of *C. occidentale* are rarely more than one cell thick, and the cells seldom tuberculated. Additional cells situated beneath the peridium of the latter are called 'concomitant cells'. The length and width of the peridial cells of *C. ribicola* are greater than in the same cells of *C. occidentale*. The difference in aecidiospore lengths, and the gross characters of the sori are usually sufficient to distinguish between the two species, but in occasional specimens the two rusts overlap in these characters.

YORK (H. H.), SNELL (W. H.), & RATHBUN-GRAVATT (ANNIE). **The results of inoculating Pinus strobus with the sporidia of Cronartium ribicola.**—*Journ. Agric. Res.*, xxxiv, 6, pp. 497–510, 1 pl., 3 graphs, 1927.

A preliminary report of this work on the inoculation of white pine (*Pinus strobus*) seedlings and trees with sporidia of blister rust (*Cronartium ribicola*) collected from *Ribes nigrum*, *R. odoratum*, and *R. cynosbati*, has already appeared [*R.A.M.*, v, p. 262], and the methods used are described therein. Temperature and humidity tests showed that infections occurred at rather high relative humidities and medium temperatures, but the extreme ranges were not determined. Only sporidia from the three above-mentioned species of *Ribes* were tested, and these infected both potted seedlings and grown pines *in situ*. No symptoms of infection developed on *Pinus resinosa* when inoculated in the same way.

Macroscopic and microscopic symptoms showed that both one- and two-year-old needles of *P. strobus* were equally susceptible to sporidia of *C. ribicola*. Canker symptoms developed in the wood in the first or second year after inoculation. External evidences of infection, confirmed by sectioning, were visible in the needles three months after inoculation. Potted seedlings of the current year, as well as older ones, became infected. Only a small percentage of the infections had produced spermogonia or aecidia three years after inoculation.

WALKER (J. C.). **Diseases of Cabbage and related plants.**—*U.S. Dept. of Agric. Farmers' Bull.* 1439, 30 pp., 14 figs., 1927.

In this bulletin (which supersedes Nos. 925 and 1351 of the same series), the writer gives brief, popular descriptions of the following diseases of cabbage and other crucifers: club-root (*Plasmodiophora brassicae*); yellows (*Fusarium conglutinans*); black rot (*Bacterium campestre*) [*Pseudomonas campestris*]; blackleg (*Phoma lingam*); ring spot (*Mycosphaerella brassicicola*); black leaf spot, black mould, or brown rot (associated with *Alternaria brassicae* and a closely related species [? *A. circinans*: *R.A.M.*, iv, p. 324]); spot disease (*Bacterium maculicolum*); powdery mildew (*Erysiphe polygoni*); white rust (*Albugo candida*) [*Cystopus candidus*]; soft rot (*Bacillus carotovorus*); drop (*Sclerotinia sclerotiorum*); *Rhizoctonia* head rot, probably due to a distinct strain of *Corticium vagum* [*C. solani*] which is parasitic only on cabbage; wire stem or damping-off (*C. solani*) [*R.A.M.*, iv, p. 518]; *Pythium* head rot (*P. de Baryanum*) [*P. ultimum*: ibid., vi, p. 510], tipburn, and malnutrition. Recommendations for control are given, together with some general observations on farm practice in relation to the prevention of disease and notes on the dissemination of infection.

HYNES (H. J.). **Defective germination in Peas.**—*Agric. Gaz. New South Wales*, xxxviii, 3, pp. 251–254, 1927.

This paper records the results of field observations and laboratory and glasshouse studies with a view to tracing the causes of defective germination in peas experienced in parts of New South Wales. It is not uncommon to find a germination of 90 per cent. and more with local seed, as against 25 per cent. or less with imported seed planted under similar conditions. In such cases the imported seed was frequently found to be cracked, shrivelled, and discoloured. It was concluded that the faulty germination was due to the use of imported seed, much of which was found to have rotted in the soil apparently from the action of certain fungi which were isolated from the surface of the seed, the trouble being accentuated by the high temperatures prevailing during the early part of the year, and being particularly noticeable in cracked or damaged seed.

Tests on the surface sterilization of Greenfeast seed showed that mercuric chloride (0·1 per cent. for 20 minutes), or alcohol (70 per cent. for 2 to 3 minutes) followed by mercuric chloride (0·1 per cent. for 20 minutes) gave satisfactory results and did not injure germination or subsequent growth. Germination was somewhat retarded by calcium hypochlorite, and alcohol used alone did not completely disinfect the seed.

Pathogenicity tests with the four fungi isolated from the imported seed, *Phoma* sp., *Rhizoctonia* sp., *Cephalothecium* sp. and a sterile fungus, showed that these organisms were capable of reducing the germination of pea seed and of checking the development of the plants through injury to the stem and root system. The two first-named were the most virulent.

BÖNING (K.). **Die Mosaikkrankheit der Rübe.** [The mosaic disease of the Beet.]—*Forsch. auf dem Gebiet der Pflanzenkrankh. u. der Immunität im Pflanzenreich*, iii, pp. 81–128, 17 figs., 1927.

After an introductory note contributed by Schaffnit and a concise review of the relevant literature, the author discusses the etiology, external and internal symptoms, transmissibility, attendant physiological phenomena, economic importance, varietal susceptibility, and control of beet mosaic in the light of recent researches at Bonn [*R.A.M.*, vi, p. 266]. It is thought that this mosaic was first described by Prillieux and Delacroix under the name 'jaunisse' in 1898 (*C. R. Acad. de Sci.*, cxxvii, p. 338).

Various forms of the disease are distinguished, the most typical consisting in the development of almost circular, sharply delimited lesions attaining the size of a pin's head on leaves of medium age. These spots may be of a uniformly light colour, but more often they are composed of several yellowish-green, translucent zones, radiating from an apparently normal, dark green centre. The term 'stipple mosaic' is proposed for this form of infection.

In the so-called 'spot mosaic', which may occur either in the intercostal regions or on the veins of the leaves, the pale green, zoneless lesions are irregular, sharply delimited, and coalescent.

Very young leaves often show minute, circular dots like needle-pricks, in addition to the larger lesions. This type of infection may be termed 'point mosaic'.

In 'net mosaic' the diseased areas assume the form of narrow, interconnected channels, either following the vascular bundles or running through the intercostal regions. This type of infection can only be observed on young leaves, the network gradually merging at later stages into stipple or spot mosaic.

In general, these purely external symptoms do not represent any serious damage to the plant. However, a much more severe form of the same disease, which may be termed 'curl mosaic', sometimes occurs on two-year-old beets (and occasionally on younger ones). The affected leaves are crooked and distorted owing to the healthy areas growing much more rapidly than the diseased. When attacked during the first year the symptoms become more marked in the second year of growth, during which the plants are stunted and bear little seed.

The writer's observations confirm Lind's statement (*Tidsskr. for Planteavl*, xxii, p. 444, 1915) that infection originates in the rosette or growing-point of the plant and gradually proceeds outwards. Thus plants inspected in June show no sign of disease either on the outer foliage or on the almost-white, folded heart leaves, while the intermediate leaves are heavily infected. In addition to the yellow discoloration, abnormal thinness, and distortion of the foliage

accompanying mosaic, the occasional occurrence of lancet-shaped leaves on one-year-old beets is mentioned.

The anatomical examination of diseased leaves revealed no sign of any destructive process accompanying the formation of spots, which rather represents an arrest of the specific differentiation of isolated portions of the tissues. No trace of any visible causal organism could be found, and intracellular bodies [*R.A.M.*, vi, p. 431] were not detected with certainty. Chlorophyll formation is retarded in the pale spots in quite young leaves, but it is difficult to detect any regular differences in the chlorophyll corpuscles of diseased and healthy parts of full expanded leaves. The pale colour in these appears to be due to lesser thickness of the leaf and perhaps a less intense green colour in the chlorophyll.

It was shown by experiments that mosaic disease of beets, is mainly, if not exclusively, transmitted by insects. After feeding on diseased beets for at least 14 days, the black beet or bean aphid (*Aphis fabae*) [*A. rumicis*] and several types of green aphids transmitted infection to healthy plants in 10 to 12 days. Artificial infection by grafting was successful, but juice inoculations gave doubtful results.

In an experiment to test the effect of various nutrients on the development of mosaic, the most marked symptoms occurred in plants receiving an inadequate supply of phosphoric acid. The nitrogen content of diseased leaves was slightly higher than that of healthy ones.

All the varieties of fodder and sugar beets (22 of each) tested for their reaction to mosaic were found to be more or less susceptible. The disease is also transmissible by insects to red beets and mangolds.

Estimates from field experiments at Bonn indicated an average loss of 20 per cent. from mosaic, while the sugar content of fodder beets may be reduced to one-third of the normal.

It has recently been stated (*Arb. Biol. Reichsanst. für Land- u. Forstwirtsch.*, xiv, p. 291, 1926) that the principal vector of beet mosaic, *A. fabae*, overwinters exclusively on the spindle tree (*Euonymus* sp.). Should this fact be confirmed, the eradication of the alternate host might prove a valuable means of control. Other measures should include the cultivation of relatively resistant varieties and the eradication of diseased plants, especially seed bearers, early in the year.

NATTRASS (R. M.). **Onion immunity trials, 1926.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1926*, p. 65, 1927.

This is a further report on the varietal resistance of onions to white rot (*Sclerotium cepivorum*) [*R.A.M.*, v, p. 712] based on experiments carried out in 1926 near Bristol. The plants were grown on land heavily infected with the fungus. The percentages of diseased bulbs lifted on August 12 were as follows: Magnum Bonum 25·2, Giant Zittau 21·4, Cranston's Excelsior 19·7 and 14·2, A1 17·7, White Lisbon 16·9, Bedfordshire Champion 15·7, Wroxham Globe 9·6, Rousham Park Hero 7·5, Up-to-Date 5·1. No

variety proved immune, but the season was exceptionally favourable to the development of the disease.

PROUDLOCK (A. W.). **Asparagus and its cultivation.**—*Journ. Min. Agric.*, xxxiii, 11, pp. 1035–1043, 4 pl., 1927.

Brief, popular notes are given on three fungous diseases of asparagus known to occur in England. Rust (*Puccinia asparagi*) has appeared only in a few isolated cases. A reddish, streaky discoloration of the blanched underground part of the 'grass' sometimes known as rust, is not of fungous origin. Coppery web (*Rhizoctonia crocorum*) attacks the underground parts of the plant, causing collapse and death. Cure is scarcely practicable, and new beds should be formed on clean land, care being taken to plant only healthy crowns or roots. Diseased material should be burnt, and bleaching powder [chloride of lime] (2 oz. per sq. yd.) may be incorporated with the soil in the old beds during the summer as a disinfectant. The affected beds should not be planted with asparagus, potatoes, carrots, beets, marigolds, lucerne, or saffron crocus [*Crocus sativus*] for at least one or two years. *Zopfia rhizophila* has recently been found on old roots, producing small, black fructifications about the size of a pin's head. In Italy this fungus is regarded as the cause of a root canker, but in France it appears to behave as a saprophyte. So far, in England, it has only been found on old roots.

STIRRUP (H. H.) & EWAN (J. W.). **Report on Celery blight and its prevention.**—*Midland Agric. & Dairy Coll., Sutton Bonington, Loughborough, Bull.* 14, 11 pp., 2 figs., 1927.

The symptoms of leaf spot or blight [*Septoria apii*] of celery (the former term being applied to the early, and the latter to the more advanced stages of the disease) are described in popular terms [*R.A.M.*, vi, p. 332]. This disease was extremely destructive in certain parts of England in 1926. The most favourable conditions for its spread are those that check the growth of the plant while stimulating that of the parasite, such as a dry spell with cool dewy nights. The original infection is stated to be almost exclusively due to the use of infected seed, but the authors' experiments in seed disinfection by means of formalin or hydrogen peroxide have failed to give reliable results. In addition to clean cultivation, spraying with Bordeaux or Burgundy mixture is recommended as a valuable preventive measure against celery blight. In 1926 the average weight of 100 bundles of celery sprayed with these preparations was 18 cwt. 2 qrs. and 18 cwt., respectively, compared with only 9 cwt. 2 qrs. for the unsprayed. The total cost of spraying one acre (producing 1,500 bundles) eight times was £3, and the estimated net profit (calculating 1*s.* 0¾*d.* per bundle for treated and 5*d.* for untreated celery) was £45 8*s.* 9*d.*

TUCKER (C. M.). **Pigeon Pea anthracnose.**—*Journ. Agric. Res.*, xxxiv, 6, pp. 589–596, 3 figs., 1927.

Colletotrichum cajani Rangel was found causing a rather common disease of pigeon pea (*Cajanus indicus*) in Porto Rico. Spotting of the pods and leaves, blackening and shrinking of the veins,

premature leaf fall, and distortion, abortion, and death of the pods are the chief symptoms. The losses are mainly due to the dropping of young pods, and the discoloration and decay of some or all of the seeds in the affected pods. The amount of damage incurred increases with the age at which the crop is harvested. In January, 1925, 86·5 per cent. of pods were found to be infected, and the same gathering of pods yielded 36·3 per cent. of unmarketable seeds. The most important factor determining the amount of disease seems to be moisture; infection is most serious in periods of heavy rainfall.

The conidia are cylindrical, broadly elliptical or irregular, with rounded ends, and 12 to 17 by 3·5 to 7·2 μ in diameter. Setae are numerous on old pod spots but rare on the leaves, usually somewhat curved, septate, and averaging 100 by 3·5 μ.

The cultural characters of the causal organism are briefly described. Steamed pigeon pea pods was the only medium in which conidia were produced after one week. Appressoria apparently analogous to chlamydospores were observed after two months on potato-dextrose agar and steamed pigeon pea pods. The pathogenicity of the fungus was proved by successful inoculation and subsequent re-isolation. Attempts to inoculate varieties of *Phaseolus vulgaris* susceptible to *C. lindemuthianum* with the pigeon pea fungus were unsuccessful.

VAN NIEKERK (S. W.) & THERON (C. J.). **American stocks. Investigation of grafted Vines.**—*S. Africa Dept. of Agric. Bull.* 10, 11 pp., 1927.

The authors, in this pamphlet, record the results of an investigation of American stocks of grafted vines in South Africa. A short description of the utility of, and the conditions suitable for, the best known stocks is given.

The disease known in South Africa as 'tandpyn' or short joints [*R.A.M.*, iii, p. 75] is stated to be gradually spreading, and causing considerable damage. This complaint is thought to be identical with court noué in France. Exhaustion of the stock after very heavy bearing increases the disease and may even be its cause. There is, so far, no proof that American stocks are non-susceptible, but almost all cases occur in Hermitage and Stein vines which are grafted on Aramon or Metallica. There is evidence from the patchy nature of the disease that it spreads from stock to stock.

The cause has been attributed to an insect and spraying with lime-sulphur recommended. It is stated, however, that Van der Bijl believes that the term 'tandpyn' includes more than one disease, and that it is due to unfavourable growth conditions, or to a fungus not yet identified which enters the shoots through wounds and causes a discoloration of the wood. The writers recommend that all pruning tools be sterilized before use, and the prunings collected and burned.

RODRIAN. **Erfahrungen mit Staub- und Spritzmitteln gegen Peronospora im Jahre 1926 unter besonderer Berücksichtigung von Nosprasen, Nosperit, und Nosprasit der I. G. Farbenindustrie.** [Experiments with dusts and sprays against

Peronospora in the year 1926, with special reference to nosprasen, nosperit, and nosprasit of the I. G. Farbenindustrie.]—*Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 22–26, 1927.

The writer describes the results of experiments in the control of *Peronospora* [*Plasmopara viticola*] on vines in Hesse-Nassau, where the disease was extremely destructive in 1926. Nosprasen [*R.A.M.*, v, p. 533] with an admixture of lime gave good combined control of downy mildew and the vine moth [*Clysia ambiguella*], and nosprasit, a readily soluble preparation requiring no lime [ibid., vi, p. 78], was also efficacious. Six applications of nosprasit dust were more effective than four of Bordeaux mixture.

KRAMER. **Ueber die Bekämpfung der Rebschädlinge in Württemberg im Jahre 1926.** [On the control of Vine pests in Württemberg in the year 1926.]—*Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 26–29, 1927.

Nosperit [*R.A.M.*, vi, p. 77], used in liquid form at the rate of 1·5 per cent. for the first two applications and at 2 per cent. for later ones, gave very satisfactory control of *Peronospora* of the vine [*Plasmopara viticola*] in Württemberg in 1926. Nosperit dust also satisfied most of the necessary requirements, though somewhat finer grinding is desirable; the disease was well controlled by repeated applications during blossoming. Nosprasen [see preceding abstract], applied in solution as above, was very efficacious in the combined control of downy mildew and the vine moth [*Clysia ambiguella*]. Both nosperit and nosprasen may be considered as fully equal in efficiency to Bordeaux mixture.

RAVAZ (L.). **La grillure des feuilles.** [Leaf scorch.]—*Ann. École Nat. d'Agric. Montpellier*, N.S., xix, 1, pp. 5–12, 1 col. pl., 1 fig., 1927.

A brief account is given of a leaf scorch of the vine which is stated to have been rather widespread since 1922 in the vineyards of south-east France. The trouble chiefly affects the lower leaves on the stocks. It starts by the appearance at any point of the leaf blade (mainly on the chief veins towards the periphery of the leaf) of small spots varying in colour from vinous red to dark brown, which gradually extend concentrically and dry out, finally attaining a diameter of 2 to 5 cm.; in small-leaved varieties, they may involve up to half of the leaf blade, occasionally killing the whole leaf. The disease was also seen to attack the young grape bunches, which are then killed while still green. The trouble appears to occur but rarely on varieties of *Vitis vinifera*, while American varieties, such as *V. rupestris* and *V. labrusca* and their progeny, and many of their hybrids, are highly susceptible. So far it has not been observed to cause any considerable reduction of the yield.

Isolations from the diseased spots yielded *Botrytis cinerea*, the cause of grey rot of grapes, a disease which is rather common in the region. In the centre of the spots the mycelium was found to grow intercellularly, and might be considered as a secondary organism, but the extension of the spots is doubtless attributable to it, as it was also found in the marginal zones before serious injury to the tissues was apparent. Under natural conditions the mycelium

remains sterile, but it is easily induced to fructify by placing on the spots a drop of sterilized grape juice.

Observations by local vine growers indicate that the disease is amenable to control by spraying the vines with 3 per cent. Bordeaux mixture.

BIFFEN (R. H.). **Annual Report for 1926 of the Botanist.**—*Journ. Roy. Agric. Soc. of England*, clxxxvii, pp. 346–351, 1927.

A new disease of wheat, the cause of which is obscure, was fairly general in England during the period under review. A deep blackish-brown patch appears immediately below the ears just as they begin to ripen. Smaller patches may extend downwards on the straw for some three or four inches, and occasionally the chaff is similarly discoloured. The intensity of the colour diminishes as the plants mature, and the yield of infected crops does not appear to be reduced. No organism could be detected in the diseased material.

Wheat rusts seem to have been unusually prevalent in 1926. Yellow rust (*Puccinia glumarum*) was exceptionally severe during the early summer. An attack of brown rust (*P. triticina*) then occurred, and black rust (*P. graminis*) caused an estimated loss of 30 per cent. of the crop in some severely infected localities of the eastern counties.

Rhynchosporium graminicola was unusually abundant on barley but caused little damage apart from a temporary arrest of growth.

Potato blight [*Phytophthora infestans*] was general and severe, the first case being noted at Cambridge early in June. Observations showed that the disease frequently originates on the sites of old potato clamps in which plants have grown from tubers rejected in grading. These seats of infection should either be thoroughly cleaned up immediately after the disposal of the tubers, or the tops from the latter should be destroyed by the beginning of June.

Chocolate spot disease of field beans (*Bacillus lathyri*) [*R.A.M.*, ii, p. 99] was much in evidence in the eastern and southern counties, premature defoliation occurring in some cases. The sclerotia of a species of *Sclerotinia* were sometimes found on the roots and stem bases of diseased beans growing on heavy clay soils, but in other cases the fungus was absent, so that death may have been due to the asphyxiation of the root system from water-logging of the soil. Other important diseases affecting leguminous crops were clover sickness and crown gall of lucerne (*Urophlyctis*) [*trifolii*].

There is stated to be a general tendency to defer the very expensive lime treatment of finger-and-toe disease of turnips, swedes, and cabbages (*Plasmodiophora*) [*brassicae*] until the soil has become thoroughly infected. Three severe cases which were causing exceptionally heavy losses were treated in 1926. There are now a number of resistant varieties of swedes available, which should be cultivated in order to avoid liming. *Pseudomonas campestris* was reported as destroying one-third of a crop of swedes.

WORMALD (H.). **Plant Pathology.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1926, to 31st December, 1926*, pp. 57–59, 1927.

In addition to items already noticed, the following are of interest.

While evidence is available that the nature of the stock influences the susceptibility of the scion to apple mildew [*Podosphaera leucotricha*] and scab [*Venturia inaequalis*], none has been obtained of a similar effect in regard to apple canker [*Nectria galligena*] and die-back of plums [*R.A.M.*, vi, p. 563]. Inoculations on young plum shoots and fruit with an organism isolated from cankered areas on the stems of plum trees affected by die-back have given rise to bacterial lesions, thereby demonstrating its pathogenicity.

Raspberry mosaic has been shown to be transmissible by grafting.

Inoculation tests with the species of *Verticillium* associated with hop wilt [see above, p. 579] have so far given negative results on hops, but the fungus causes a wilt when inoculated on potato haulms.

MASSEE (A. M.). **Entomology.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1926, to 31st December, 1926*, pp. 63–65, 1927.

Definite evidence is stated to be now available in support of the view that the big bud mite [*Eriophyes ribis*] is a cause of the transmission of reversion in black currants [*R.A.M.*, vi, p. 564]. Healthy bushes have been directly infected with a new species of mite of the genus *Phyllocoptes* in order to ascertain whether it is also a carrier of the disease.

Direct infections of healthy raspberry plants with the raspberry aphid [*Aphis rubiphila*] gave negative results as regards the transmission of mosaic [ibid., vi, p. 528].

NICHOLLS (H. M.). **Annual Report of the Government Microbiologist.**—*Tasmania Agric. and Stock Dept. Rept. for 1924–25*, p. 4, 1926.

Extensive investigations on raspberry diseases were conducted during the period under review. The most destructive of those occurring in Tasmania were found to be anthracnose (*Gloeosporium venetum*) [*Plectodiscella veneta*], rust (*Gymnoconia interstitialis*), stem disease (*Mycosphaerella rubina*), and a root disease due to *Rosellinia* sp. Other diseases examined included bacterial spot of mulberry leaves, *Botrytis cinerea* on apples, *Erysiphe polygoni* on *Delphinium*, a *Fusarium* rot of asters [*Callistephus chinensis*], and *Gloeosporium mezerei* on young plants of *Daphne*.

CHABROLIN (C.). **Quelques maladies des plantes cultivées en Tunisie. Rapport sur les travaux exécutés en 1926 par le Laboratoire de Botanique et Pathologie végétale de l'École Coloniale d'Agriculture de Tunis.** [Diseases of cultivated plants in Tunis. Report on the work done in 1926 by the Laboratory of Botany and Plant Pathology of the Colonial College of Agriculture of Tunis.]—Reprinted from *Bull. Direct. Gén. de l'Agric., Comm., et Colonis.* [Tunis], 21 pp., 6 figs., 1927.

In this report of the work carried out during 1926 at the Colonial College of Agriculture, Tunis, the writer states that the most prevalent disease of the olive in that area has hitherto received scant attention. This is the grey spot disease, caused by *Cercospora cladosporioides* Sacc. Rather large, light grey spots of irregularly ovoid shape appear on the lower surface of the leaves. At first,

the upper surface retains its normal colour, but gradually it, too, shows scattered, yellow spots, and ultimately the affected areas die. From the outset all the affected tissues contain a fine, intracellular mycelium, branches from which emerge through the stomata to form tufts of conidiophores. Generally each conidium has from 5 to 7 septa, and they range from 30 to 80 (generally 50 to 70 by about 4 μ in diameter. The fungus is regarded as a larger variety of Saccardo's species, recorded in 1880 on dying leaves of *Olea europaea* in the Euganean Hills [Italy], and since reported several times in Italy but always regarded as saprophytic or weakly parasitic. In Tunis, however, *C. cladosporioides* is capable of infecting healthy leaves of sound trees, all varieties of the olive being attacked.

At some oases in south Tunis, notably at Nefta, a wilting of date palms [*Phoenix dactylifera*] was observed, but the writer is uncertain whether this is identical with the disease known locally as 'baïoud' [*R.A.M.*, iv, p. 347]. At Toser, a disease attacked the female inflorescence of the palms, and completely destroyed the fruit. The cause of this disease, the symptoms and progress of which are fully described, was found to be *Mauginiella scaettae* Cav. [ibid., vi, p. 289]. The same trees are affected annually, but the condition is not general. The malady locally named 'doudah' [loc. cit.] has now also been found to be due to *M. scaettae*, while Foëx and Vayssière have suggested that this parasite also causes 'baïoud'.

Late blight of potatoes (*Phytophthora infestans*) developed with unusual severity in the Bizerta region, where 40 to 50 per cent. of the crop was destroyed. Degeneration diseases appeared on all the potato crops; leaf roll and frisolée were equally common, but the former did more damage.

Peaches were seriously attacked by leaf curl (*Taphrina deformans*), and as no control of this disease is attempted, the crop is very uncertain. Apricots suffered from powdery mildew (*Podosphaera oxyacanthae*).

A disease of barley developed with some severity in a field belonging to the Botanical Service, most of the crop being sickly and failing to mature. The ends of the dead roots were found to contain numerous round, thick-walled bodies, which Guyot identified as oospores of a species of *Pythium*; the author, however, is inclined to think that they were not the cause of the disease, which remains obscure. The brown spot disease of barley, due to *Helminthosporium teres*, was very rife throughout Tunis, appearing as brown spots, either singly or in groups, on the lamina of the first leaf of the seedlings. Stripe disease of barley (*H. gramineum*) was rare.

Recent progress in solving some farm problems of Illinois.—*Thirty-seventh Ann. Rept. Illinois Agric. Exper. Stat. for the year ended June 30, 1924*, 196 pp., 43 figs., 1 graph, 1 map, 1925. [Received 1927.]

The following items in this report, other than those already noticed from different sources, are of phytopathological interest. In connexion with a series of investigations on the maize diseases of Illinois, it was ascertained that the average reduction over a

three-year period from *Diplodia zeae*, scutellum rot, *Fusarium moniliforme* [*Gibberella moniliformis*], and *Cephalosporium acremonium* amounted to 23, 12, 2·4, and 1·4 bushels per acre, respectively [*R.A.M.*, vi, p. 89]. It is not known how long the causal organisms of maize rot persist in the soil, but the beneficial effect of rotation with clover has been demonstrated. By means of selection of good seed ears in the field and during germination trials it has been possible to develop a superior line of maize which is termed the Illinois Non-Pedigree. In 1923 and 1924, respectively, this line produced 2·9 and 3·1 bushels per acre more than the Illinois High Yield strain, developed through nine years of ear-to-row breeding.

A gradual decrease in the incidence of blister canker of Ben Davis apples [*Nummularia discreta*] has been effected by the excision of cankers [ibid., vi, p. 491]. It is estimated that the general adoption of this practice would prolong the average duration of life of this variety by ten years.

Experiments are in progress to develop a pear resistant to fire-blight [*Bacillus amylovorus*], which has been so destructive in Illinois that 95 per cent. of the pears cultivated at present belong to the resistant but relatively unpalatable Kieffer variety. The resistant Pineapple variety [ibid., iii, p. 278] suffers severely from winter injury in Illinois, and has been found even less agreeable in taste than Kieffer.

The Conqueror watermelon has been found resistant to wilt [*Fusarium niveum*] in Illinois, but this variety gave poor yields in 1922 and 1923. An attempt is in progress to obtain a suitable cross between Conqueror and one of the standard commercial varieties, the cultivation of which has been rendered impossible by wilt.

EDGERTON (C. W.). **Department of Plant Pathology.**—*Ann. Rept. Louisiana Agric. Exper. Stat. for 1926*, pp. 54–57, 1927.

The Louisiana sugar-cane stand was extremely poor in 1926, partly on account of red rot [*Colletotrichum falcatum*] and excessive rains. The selection of mosaic-resistant strains was continued for the sixth year [*R.A.M.*, iv, p. 593]. A high degree of tolerance was shown by the selected strains of D. 74 and Louisiana Purple. The root rot complex (growth failure) [ibid., vi, p. 186] was serious, especially in the early part of the season.

Sclerotium rolfsii and *Rhizoctonia* sp. were found to be causing heavy losses (up to 70 per cent.) in the sugar beet crop [ibid., v, p. 712].

TUCKER (C. M.). **Report of the Plant Pathologist.**—*Rept. Porto Rico Agric. Exper. Stat. 1925*, pp. 24–40, 7 figs., 1927.

This report contains the following items of interest other than those already noticed from different sources. The pathogenicity of the species of *Fusarium* isolated from vanilla plants suffering from root disease [*R.A.M.*, v, p. 284] has been demonstrated by soil inoculation experiments. The rather low percentage of infection previously obtained [loc. cit.] by the inoculation of plants grown in sterilized fibre was found to be due to an inhibiting substance,

probably tannin, produced during autoclaving of the moist fibre. The fungus retains its virulence in soils for at least four years. It produces a cytolytic enzyme which causes rotting of the cortex, the vascular cylinder not being invaded until later; in no case was an obstruction of the vessels by hyphae observed. Positive results were given by the inoculation of wounded vanilla stems with the root fungus, while *F. cubense* failed to produce infection. The vanillon, an inferior type of vanilla, has been found highly resistant to root disease, and may, perhaps, be used in the production of hybrids.

A comparative morphological and physiological study is in progress with 45 strains of *Phytophthora* isolated from cacao, coco-nut, cotton, breadfruit [*Artocarpus incisa*], papaw [*Carica papaya*], citrus, abaca [*Musa textilis*], tomato, eggplant, *Odontadenia speciosa*, *Dendrobium maccarthiae*, *Hevea* rubber, *Erythrina*, *Borassus flabellifer*], and *Hibiscus sabdariffa* [see below, p. 608]. Considerable cultural differences appear to exist between the various strains, and the morphological divergences, though slight, are fairly constant. The most striking feature of these strains is their highly specialized pathogenicity. The possibility of oogonial formation in mixed cultures is being tested with all combinations of the 45 strains. Seventeen strains have been grown together so far, and in each case of oogonial formation one of the strains has been isolated from cacao. All the oogonia hitherto produced are of the amphigynous type [ibid., ii, p. 183].

Phytophthora boll rot of cotton was observed in Porto Rico for the first time during the year. The organism apparently belongs to the *faberi* group, though it differs considerably from the coco-nut strain. The severity of this disease varies directly with moisture conditions.

Rhizoctonia ferruginea, originally isolated from sugar-cane [ibid., i, p. 275], caused severe symptoms of damping-off in pigeon pea [*Cajanus indicus*] seedlings in the greenhouse. A series of inoculation tests was carried out to determine the host range of the organism, and great susceptibility was shown by the following plants: cabbage, carrot, beet and Swiss chard [*Beta vulgaris*], cotton, sweet pea [*Lathyrus odoratus*], onion, turnip, cucumber, chayote [*Sechium edule*], bean, spinach, and lettuce. Tomatoes and *Crotalaria juncea* are only slightly susceptible, while maize, sugar-cane from cuttings, sweet potatoes, and Bermuda grass [*Cynodon dactylon*] are immune. The results of experiments to determine the effect of various percentages of moisture on the incidence of infection show that, in the case of pigeon pea and cotton, the disease is more serious on dry than on wet soils, while with beans the reverse seems to be the case.

Pigeon peas are extensively damaged every year by stem canker associated with *Botryosphaeria xanthocephala*, a fungus which was reported as a saprophyte on the same host in India.

Wilt (*Bacterium solanacearum*) is one of the most destructive diseases of tomatoes in Porto Rico. Experiments are in progress to ascertain the value of immersion of the roots in 0·25 per cent. uspulun as a preventive measure: preliminary results indicate that this preparation is toxic to the bacteria without injuring the plants.

In a test with 36 varieties and hybrids of tomatoes an average of 60 per cent. of the plants contracted wilt disease, the Truckers' Favourite variety being particularly susceptible.

Anthracnose (*? Colletotrichum gloeosporioides*) [*Glomerella cingulata*: ibid., v, p. 109] occurred on avocados at Villalba, the Fuerte variety being the most susceptible.

Sugar-cane was attacked by leaf spots associated with *Helminthosporium sacchari*, *Leptosphaeria sacchari*, and *Phyllosticta sacchari*. The first-named was commonly present on old plants, and proved fatal to some seedlings [ibid., iv, p. 243]. The pycnidia of *P. sacchari* and the perithecia of *L. sacchari* were often found in the same spots, suggesting a possible connexion between these organisms.

Coffee is generally, but not severely, attacked by thread blight (*Corticium koleroga*) in the rainy season. *Gliricidia maculata* is very susceptible to the same fungus under damp conditions. White root disease, due to an undetermined fungus, is the most destructive malady affecting coffee at the Station. The fungus, which brings about a yellow discoloration and wilting of the foliage, occurs in white strands and patches on the base of the trunk and the roots. The prevalent black root disease (*Rosellinia bunodes*) produces similar symptoms to the white root rot, except in the black coloration of the fungus on the collar. Leaf and berry spot (*Cercospora coffeicola*) is not of great importance, and *Omphalia flavida*, a serious disease at higher altitudes, does not occur at the Station.

Leaf spot or streak of maize (*Helminthosporium turcicum*) [ibid., vi, p. 547] is a conspicuous and occasionally serious disease. Maize root rot (*Fusarium moniliforme*) [*Gibberella moniliformis*] has been prevalent in low, poorly-drained soils. Bacterial wilt (*Aplanobacter stewarti*) [ibid., iv, p. 85] severely attacked a planting of hybrids between field and sweet maize on low ground. The maize rust due to *Uredo pallida* [*Puccinia pallescens*: ibid., v, p. 392] is common, but does little damage.

Areolate mildew (*Ramularia areola*) causes severe damage to cotton leaves under humid conditions. The cotton leaf spot due to *Phyllosticta malkoffii* resembles that caused by *H. gossypii* [ibid., vi, p. 423], but is much less serious. This disease has not previously been reported from Porto Rico. A *Fusarium* boll rot is destructive at Mayaguez during the rainy season. *Diplodia* boll rot (*D. gossypina*) and damping-off (*Rhizoctonia* sp.) were also recorded.

Anthracnose (*Glomerella cingulata*) was reported on guava [*Psidium guajava*].

Okra [*Hibiscus esculentus*] is extensively attacked and defoliated by leaf mould (*Cercospora hibisci*), the dark conidiophores and spores of which nearly cover the under sides of the leaves. The large bleached spots resulting in defoliation produced by *C. capsici* may often be observed on [chilli] pepper [*Capsicum annuum*]. A wilt (*Fusarium* sp.), not previously observed, was prevalent in this crop on heavy clay soils. Chilli plants affected by mosaic at San Germán showed a wrinkling and distortion of the leaves, but the characteristic yellow mottling was absent.

Brown spot (*Helminthosporium oryzae*) is estimated to have killed 15 per cent. of the rice seedlings in variety trials at the Station.

Anthracnose (*Colletotrichum agaves*) of sisal hemp, not hitherto reported from Porto Rico, is of considerable importance.

Cercospora nicotianae was found on tobacco at the Station and *Phyllosticta nicotiana* on leaves received from Corozal.

Yams [*Dioscorea* sp.] were infected by *C. carbonacea*.

FAWCETT (G. L.). **Departamento de botánica y patología vegetal.** [Department of Botany and Phytopathology.]—*Rev. Indus. y Agric. Tucumán*, xvii, 9–10, pp. 207–209, 1 fig., 1927.

Cold chlorosis of sugar-cane [*R.A.M.*, vi, p. 184] is stated to be most prevalent in Tucumán at a temperature of 0° to 8° C. Curly leaf of sugar beet has been definitely ascertained to be transmitted by *Agallia sticticollis*, the American insect vector, *Eutettix tenella*, being unknown in the Argentine [ibid., v, p. 272].

ROBINSON (W.). **Some features of crown gall in plants in reference to comparisons with cancer.**—Reprinted from the *Proc. Roy. Soc. Med.*, xx (Section of Tropical Diseases and Parasitology), pp. 53–56, 1927.

After criticizing the bacteriological evidence on which Blumenthal and his collaborators in Germany, and Fejgin and others in France [*R.A.M.*, iv, p. 727; v, pp. 475–6], have based their theories of the agency of *Bacterium tumefaciens* in the causation of malignant growths in animals, the author refers to recent work by Warburg in Berlin on certain aspects of cellular physiology considered to bear directly on the problem. From exact experimental methods Warburg has concluded that in tumour tissues the oxygen respiration of the growing cells is impaired, while the fermentative activity continues. In the author's opinion, it is possible that in crown gall *Bact. tumefaciens* modifies the oxygen relations of the cells, owing to its strongly aerobic tendencies, so that internal changes, resulting in proliferation, are set up. Whether the tissues in crown galls show a similar type of metabolism to that found by Warburg in animal tumours remains to be seen. In their cellular physiology the plant galls may have some points in common with malignant animal tumours, even though a causal connexion between *Bact. tumefaciens* and the latter cannot be regarded as established.

RIVERA (V.). **È necessaria la ferita del tessuto per la produzione di tumori da 'B. tumefaciens' su vegetali?** [Is the wounding of the tissues necessary for the production of tumours on plants by *Bacterium tumefaciens*?]—*Boll. Accad. Pugliese di Sci.*, i, 6, 1926. [Abs. in *Bull. Inst. Pasteur*, xxv, 12, pp. 564–565, 1927.]

Experiments on infection by *Bacterium tumefaciens* of *Ricinus* [*communis*] and geranium failed when the cultures were applied to the unbroken epidermis, while tumours developed in all the plants inoculated through wounds. The dissolution by xylol of the waxy epidermal covering of *Ricinus* failed to modify these results. In another test growing cabbage-stalks and terminal branches of *Ricinus* were placed in flasks of water and the cut surfaces inoculated with *Bact. tumefaciens*. The organism was absorbed into the vascular system with the ascending transpiration

stream, but no tumours were produced. A certain stimulatory reaction, however, was expressed by the formation of numerous roots on the cut surfaces.

FERNANDES (D. S.) & VAN DIJK (J. W.). **De instervingsziekte bij de Cacao.** [The die-back disease of Cacao.]—*Meded. Landbouwproefstat. Suriname* 1, 47 pp., 1 pl., 1926.

The die-back disease of cacao, formerly attributed to *Diplodia cacaoicola* [*Botryodiplodia theobromae*], has been found to be caused in Surinam exclusively by abrupt alternations in the soil-water relations. The phenomenon, which causes heavy losses among both old and young trees, is stated to be almost solely confined to the so-called 'polders' [land reclaimed from the sea], where the salt water produces a desiccating effect on the vegetation.

Sections through diseased branches showed brown to nearly black stripes in the wood, bast, and cambium, in more or less regular concentric rings. The discoloured areas continue for some distance down the branches and suddenly disappear, while in an upward direction they extend from the nodes into the petioles, and even the midrib. Fresh discolorations occur quite independently of the old ones. No trace of the disease was discernible in the roots, and no parasitic organism was found either by microscopic examination or isolation methods. The arrangement of the discoloured areas points to a periodic occurrence of the condition occasioning them, and this was borne out by the authors' field and laboratory observations in 1924 and 1925. Repeated attacks can cause the death of the trees, especially if their general condition is not good.

Die-back is not confined to cacao, but affects all other trees and shrubs in the polders. The symptoms of the disease were experimentally produced by a reduction in the normal water supply, while thick shading reduced its incidence by diminishing transpiration.

Among the possible contributory factors to die-back are mentioned the 'curl' disease [*Marasmius perniciosus*: *R.A.M.*, v, p. 346], which diminishes transpiration by the destruction of the foliage, and by thinning the shade reduces the humidity of the soil; thrips, which cause similar, but more severe, disturbances: and the physical condition of the soil, which should be improved by liberal applications of lime, adequate shading, and the use of green manures, e. g., *Tephrosia candida*.

Canker (*Phytophthora faberi*) and other fungous diseases of cacao are stated to be of secondary importance in Surinam.

Notes are given on the methods of cultivation practised in other cacao-growing countries, and recommendations are made for the control of die-back by adequate irrigation; relatively close planting; provision of trenches for the rapid carrying off of the salt water; and construction of dams to prevent the loss of fresh water during the dry season.

ALLEN (RUTH F.). **A cytological study of orange leaf rust, Puccinia triticina physiologic form 11, on Malakoff wheat.**—*Journ. Agric. Res.*, xxxiv, 8, pp. 697–714, 7 pl., 1927.

This paper reports in detail the second of a series of cytological

studies of *Puccinia triticina* physiological form XI on wheat [*R.A.M.*, vi, p. 20], and deals in particular with the reaction of this rust on the consistently resistant wheat variety Malakoff.

Inoculation experiments and subsequent microscopic examination showed that the fungus enters the stomata of the host promptly and normally; by the second day after inoculation 91 per cent. of the germ-tubes had entered in the case of seedling infections. After entry the first host cells invaded collapse and die promptly, and many of the invading germ-tubes die at this stage. If the mycelium survives the first struggle, it gains slowly in strength. As successive host cells are entered by haustoria, the host reaction becomes milder and slower until finally an haustorium may form, expand partially, and function for a short period. Generally the fungus dies before reaching the reproductive stage; only rarely a minute uredosorus is formed, and in such cases the host tissue dies and fungous growth ceases after the formation of a few spores. It is suggested that the process of adjustment between host and parasite may be one of the factors in producing the 'X' or 'heterogenous' type of infection [*R.A.M.*, ii, p. 158].

In infections on plants which were exposed to bright weather conditions and a scant water supply, a zone of host tissue surrounding the infection showed localized wart-like swellings on the walls, due to the degeneration of the pectic constituents of the cell membranes. In seedlings and older plants inoculated during the dark, wet weather of January and February, this reaction was slight or absent. This breakdown of pectic substances, which occurs in cells beyond those reached by the fungus, may be due to acids formed in the dying and decomposing host cells within the mycelial area, but it is thought to be more probably caused by an enzyme secreted by the fungus. The difference in the amount of pectic reaction in plants subjected to different environmental conditions may be due to a difference in the composition of the mesophyll cell walls brought about by these conditions.

SCHULTZ-VERDROW. **Versicherung gegen Getreiderost.** [Insurance against rust of cereals.]—*Illus. Landw. Zeit.*, xlvii, 16, pp. 209–210, 1927.

In connexion with the problem of insurance against rust of cereals [*Puccinia* spp.] in Germany [*R.A.M.*, vi, p. 430], the writer's inquiries have elicited information from a number of landowners indicating that the case for insurance is obvious, and should present no greater technical difficulties than that of insurance against fire or hail.

RODENHISER (H. A.) & STAKMAN (E. C.). **Physiologic specialization in Tilletia levis and Tilletia tritici.**—*Phytopath.*, xvii, 4, pp. 247–253, 1 graph, 1927.

By comparing the amount of bunt produced under similar conditions on three varieties of wheat: Einkorn, C.I. 2433, Marquis, C.I. 3641, and Kota, C.I. 5878, when the seeds were inoculated with spores of strains of *Tilletia levis* and *T. tritici*, the authors conclude that there are at least three physiologic forms of *T. levis* and two of *T. tritici* [*R.A.M.*, vi, p. 535]. The strains of *T. levis* tested were

obtained from Minnesota, Italy, Egypt, and two districts in Hungary. The strain from Minnesota constituted one physiologic form, those from Hungary another, and that from Egypt the third. Possibly the strain from Italy may be a fourth. The collections of *T. tritici* were obtained from New Zealand, Hungary, Norway, Sweden, Canada (Manitoba), Minnesota, California, and Washington. The two forms which can be most readily recognized are a virulent one from Norway and a relatively weak one from New Zealand. There is evidence that there are still other forms of *T. tritici*, but the tests with the other strains were not conclusive.

It seems probable that a considerable number of physiologic forms of both these fungi will be distinguishable if the proper differential hosts are used.

HOFFMANN (G.). **Nassbeize im Trockenbeizapparat.** [Liquid disinfection in the dusting apparatus.]—*Pflanzenbau*, iii, 20, pp. 318–319, 1927.

In connexion with the investigations proceeding in Germany on the disinfection of seed-grain with small amounts of liquid [*R.A.M.*, vi, p. 475], the writer describes an experiment with the Puk apparatus [ibid., vi, p. 404]. Summer wheat contaminated with bunt [*Tilletia tritici* and *T. levis*] and barley infected by stripe disease [*Helminthosporium gramineum*] were treated with solutions of 0·8, 1·6, and 3·2 per cent. germisan. The most effective concentrations probably lie between 1·5 and 2 per cent. The liquid was used at the rate of 1 l. per cwt. Only 1 to 2 per cent. of moisture was absorbed by the grain, so that drying subsequent to treatment was almost superfluous. No residues were left in the machine, and germination was not impaired. The estimated cost of this treatment is Pf. 20 per cwt. Two men can disinfect 120 cwt. of grain in ten hours.

HASPER (E.) & STUMPFF (H.). **Versuche mit verschiedenen Nass- und Trockenbeizen.** [Tests with various wet and dry disinfectants.]—*Deutsche Landw. Presse*, liv, 14, p. 192, 1927.

The authors record the result of tests conducted by the Hesse Agricultural Experiment Station at Darmstadt on the relative merits of certain liquid disinfectants and dusts against *Fusarium* disease of rye [*Calonectria graminicola*], stripe disease of barley [*Helminthosporium gramineum*], and wheat bunt [*Tilletia tritici* and *T. levis*]. The results, given in tabular form, refer only to tests made with artificially smutted wheat seed, and show that the liquid disinfectants employed, especially tillantin [uspulun-universal; *R.A.M.*, vi, p. 278], sublimoform, kalimat B, agfa, and urania, proved far more efficacious than the dusts. Of the latter, only segetan [ibid., vi, p. 86] and tutan gave complete control, while höchst dust [tillantin dust] and Sch. 714 (Höchst) were fairly effective with infection percentages of 0·38 and 0·35, respectively. The non-mercurial dusts supplied by the Merck Chemical Works at Darmstadt, the urania dust of the Holzverkohlungsindustrie, Konstanz, and especially the uspulun made by Bayer, Leverkusen, gave very poor control.

STRAIB. **Zur Haferflugbrandbekämpfung durch die Trockenbeize.** [Control of loose smut of Oats by dusting.]—*Deutsche Landw. Presse*, liv, 15, pp. 205–206, 1927.

The author states that the loss from loose smut of oats (*Ustilago avenae*) on the reported areas under this crop in Germany fell from 7·7 per cent. in 1920 to 1·9 per cent. in 1925. The danger of an increase in the disease exists, however, in that oat seed other than Svalöf's Goldregen, in which smut was very prevalent in 1926, is scarcely utilized.

Tests were carried out with a number of wet disinfectants on the seed of yellow oats, the germinating power of which was 85 per cent. The seed was sown in the open two days after treatment, 50 gm. of seed-grain being immersed in 100 c.c. of the solutions to be tested, at a temperature of 17° C. Treatment for 15 minutes with 0·1 per cent. formalin and for a similar period with 0·35 per cent. sublimoform acted as a certain preventive, as did one hour's immersion in 0·25 per cent. tillantin [uspulun-universal].

Dry disinfection was carried out by mixing the seed-grain for three minutes with a given quantity of the dust. Most of the dusts used proved ineffective, except where a large quantity was employed. The proportion of 3 gm. to 1 kg., sufficient for the control of wheat bunt [*Tilletia tritici* and *T. levis*], was not enough with any of the dusts used in the present tests to control oat smut. In concentrations of 5 gm. per kg., höchst dust [tillantin dust] and abavit B proved satisfactory. Preparation no. 225 (Saccharinfabrik, Magdeburg) was fairly effective. In no instance was the germinating power or growth of the oats impaired. The author concludes that, owing to the quantity required and to their high prices, control with dusts is uneconomic in comparison with wet disinfectants such as germisan or uspulun-universal.

NEILL (J. C.). **Oat-smut and its control. Survey and experimental work, season 1926–27.**—*New Zealand Journ. of Agric.*, xxxiv, 4, pp. 237–243, 2 figs., 1927.

Oat smut [*Ustilago avenae* and *U. levis*] is reported to have destroyed approximately 500,000 bushels of oats in the South Island of New Zealand during 1926–7. The loss in Otago and Southland has been greatly reduced since the previous year, while in Canterbury it has very much increased. This is thought to be mainly due to the care or want of care, respectively, in the treatment of the seed-oats. In one locality where seed treatment had never been carried on, and smut had never been prevalent, the disease appeared in 24 crops of oats. These were all found to have been the product of two infected crops of the previous year from a neighbouring valley.

After describing the usual method of seed treatment for smut, the writer gives the results of his experimental studies on oat smut control during 1926–7 [*R.A.M.*, v, p. 484]. With the hot water treatment (dipping for 10 mins. at various temperatures from 121° to 141° F.) the germination vigour of the seed was not impaired up to 137°. One sample of seed (Abundance) which gave 47 per cent. smut in the controls, showed no smut above 125°, while two other samples gave one smutted plant at 127° and 129°, respectively, but

none above that. A gradual increase in tallness of plants at harvest was apparent in all varieties, as compared with the control rows, from 121° to 133°, falling from 137° to control level again at 141°.

Copper sulphate gave satisfactory results only with the variety Providence, in which smut control was combined with a slight improvement in germination. In all other varieties it failed to control the smut, reduced and delayed germination, and caused an unhealthy appearance as compared with the check plants.

Formalin used in three strengths, 1 to 240 (1 pint to 30 galls. water), 1 to 320 (1 pint to 40 galls.), and 1 to 480 (1 pint to 60 galls.) for 10 minutes did not impair germination in any way, and had a beneficial effect on the plants. The 1 to 240 strength almost completely controlled smut in all varieties, the 1 to 320 reduced infection to less than 1 per cent. when it did not entirely prevent it, but the 1 to 480 strength failed to control the disease in any variety.

KAMAT (M. N.). **The control of Mosambi (Citrus aurantium) gummosis.**—*Agric. Journ. India*, xxii, 3, pp. 176–179, 2 pl., 1927.

The writer states that, since 1923, investigations have been made upon a disease marked by gummosis, which has extensively damaged the Mosambi orange (*Citrus aurantium*) [*R.A.M.*, v, p. 593] in Bombay Presidency. Isolations from the peeling bark near the gummosis lesions generally gave a Phycomycetous fungus and a species of *Fusarium*, whilst *Diplodia*, *Cephalosporium*, and bacteria were also found.

The field characters of the disease are described, and methods of treatment by removing the diseased parts and applying crude carbolic acid or Bordeaux paste, are indicated. These have proved satisfactory. Tables are given showing the extent of the damage, the results of the treatment, and the cost and labour involved.

FULTON (H. R.) & BOWMAN (J. J.). **Effect of spraying with fungicides on the keeping quality of Florida Citrus fruits.**—*U.S. Dept. of Agric. Circ.* 409, 13 pp., 5 graphs, 1927.

This paper gives the details of the tests made during six years on the improvement of the keeping quality of citrus fruits, by spraying with different fungicides at various periods during the development of the fruit, the results of which have already been noticed [*R.A.M.*, vi, p. 415]. The combined effectiveness of the recommended treatment against all rots amounted to a reduction of about one-third. The benefit derived from two applications starting before 15th April was too small to justify the extra expense; three applications were even less economically possible. Comparative results are given of tests made with 1–1–50 and 2–2–50 Bordeaux-oil in 1, 2, and 3 applications; 'improperly prepared' Bordeaux-oil; neutral Bordeaux-oil; a copper-soap spray; and lime-copper sulphate dust. The last-mentioned and lime-sulphur sprays increased the percentage of rot instead of controlling it.

DE MEL (C. N. E. J.). **Pests and diseases of Coconuts in the North-Western Province.**—*Trop. Agriculturist*, lxviii, 4, pp. 252–256, 1927.

After dealing with some pests of the coco-nut the writer gives a short account of the fungous diseases observed by him in Ceylon. Bleeding disease [*Thielaviopsis paradoxa*] is common in the Negombo District, but attacks only young plants with immature wood. The prescribed treatment [*R.A.M.*, i, p. 280] prevents wood injury wherever the outside bark has fallen off. Grey blight [*Pestalozzia palmarum*], although widespread in the province, only proves harmful to ill-nourished trees, and is checked by applying nitrogenous manures. Two types of disease resulting in complete sterility have been observed. The symptoms, tapering of the trunk until at last the crown falls off, and reduction in the number and size of the leaves, which turn yellow, in the one case, and the same with the exception of the tapering of the trunk in the other, appear to imply some form of physiological disease. As such trees have been found, however, in good soil on well cultivated estates, the possibility of the presence of a root disease is suggested. Six different fungi, namely, a *Diplodia*, a *Poria*, three species of *Fomes*, and *Polyporus zonalis* have been found associated with these diseases. The symptoms of some other diseased conditions of single palms, the causes of which were not ascertained, are briefly described.

GADD (C. H.). **The relationship between the Phytophthorae associated with the bud-rot diseases of Palms.**—*Ann. of Botany*, xli, 162, pp. 253–280, 1927.

The author advocates the restriction of the term 'bud rot' in palms to cases in which the meristematic tissues of the growing point are attacked and destroyed. He points out that diseases of this type have been shown to be caused by *Phytophthora palmivora* in the East and West Indies and by a form identified as *P. faberi* in the Philippines and Porto Rico. *P. faberi* is better known as a parasite of cacao and rubber, but in view of the fact that different strains of this fungus occur on different hosts [*R.A.M.*, iv, p. 65], it may prove to be the same species as *P. palmivora* when the two are more fully compared.

Since 1924, the author has several times isolated a species with the cultural characters of *P. faberi* from cases of coco-nut bud rot in Ceylon, where the disease is not common—though cacao and rubber are frequently attacked by *P. faberi*. Cross-inoculation experiments [which are described in detail] were carried out with isolations from all three hosts, and showed that (1) the cacao strain readily attacked wounded and unwounded cacao pods, while that from coco-nut failed to infect unwounded pods and attacked only one out of 12 wounded pods; this proved that the two strains were distinct. (2) Seedling coco-nuts were attacked through wounds under favourable conditions of moisture by all these strains, bud rot being produced, but the strains from cacao and rubber were not very virulent.

The coco-nut strain was grown in mixed culture with strains of the 'cacao group' and the *Odontadenia* strain of the 'rubber group'

of *P. faberi* [loc. cit.], with the result that oospores (18 to 30 μ, average 23·8 μ) were developed only in the latter mixture, indicating that the coco-nut strain belongs to the 'cacao group'. In this connexion the author stresses the hypothesis that *P. faberi* is a heterothallic species, and explains the occurrence of oospores in Ashby's mixed culture of *P. faberi* and *P. parasitica* [ibid., ii, p. 185] by hybridism. Though the Ceylon coco-nut strain belongs to the 'cacao group' the inoculation experiments show that it differs from the strain on cacao in Ceylon, and this explains its restricted distribution. Ashby's strains from cacao and coco-nut in the West Indies [loc. cit.] belong to two distinct groups.

In 1923 and 1924 a fruit rot of the areca palm (*Areca catechu*), resembling that known to be caused in India by *P. arecae*, was observed in Ceylon, where a number of the affected palms were eventually killed by a bud rot extending from the fruit stalks into the bud. A *Phytophthora* was isolated from the affected nuts, and the same species was isolated from the rotted buds. Coco-nuts in the same district suffered from a nut fall in 1924 which appeared to be due to a *Phytophthora*, though the fungus was not isolated. The *Areca* fungus somewhat resembled *P. faberi* and formed chlamydospores scantily but no oospores, whereas *P. arecae* is known to produce oospores in pure culture, and has not previously been found to possess chlamydospores. Inoculations with this fungus on cacao pods gave a slight infection when the pods were wounded and none when they were unwounded. On coco-nut seedlings it caused a bud rot similar to that produced by *P. faberi* from coco-nut and cacao. Fruits of the areca palm were inoculated with isolations from areca, coco-nut, cacao, and rubber. The fungus from areca proved very virulent to wounded fruit and attacked seven out of eleven unwounded; that from cacao only infected slightly one out of four wounded and failed on unwounded fruit, while the other two gave completely negative results. Inoculated wounded areca palm seedlings were attacked in favourable conditions by all four strains, bud rot being produced most readily by the areca strain. Coco-nut fruits were attacked when wounded by the same strains (that from rubber was not tested). Since the areca fungus failed to form oospores when grown in mixed cultures with both of the *P. faberi* groups it is considered to be distinct from the latter, and is regarded as probably a strain of *P. arecae* with somewhat distinct cultural characters.

WOODROOF (NAOMI C.). **A disease of Cotton roots produced by Fusarium moniliforme Sheld.**—*Phytopath.*, xvii, 4, pp. 227–238, 3 figs., 1927.

A dwarfed condition of cotton plants observed in the fields at the Georgia Experiment Station since 1920 was found to be due to *Fusarium moniliforme* [*Gibberella moniliformis*: *R.A.M.*, v, p. 550]. The pathogenicity of this fungus was proved by successful inoculation of cotton seedlings in pot cultures and in field tests. The characteristic dark brown lesions present on the roots and gradually girdling them, are described. The fungus never penetrates deeply into the cortical cells, but the spread of the disease to the lateral roots, and the persistence of the mycelium on the primary root,

where it causes a kind of dry rot, are responsible for the dwarfed condition. Experimental evidence showed that the infection is spread on the lint of cotton seeds, by air-borne spores, and by the presence of the mycelium in the soil. The improbability of internal seed infection was shown experimentally, although a pink boll rot was found to be caused by the same organism.

The cultural characters of the fungus on a number of media are given, as well as reasons for its identification as *F. moniliforme*. Cultures of this species obtained from soil in Central America and from maize were also found to produce the above symptoms on cotton.

Disinfection of cotton seed with a number of dusts was successful in producing clean seedlings when the latter were raised in a germinator, but as a means of control in the field this method was worthless on account of the infestation of the soil with the causal organism. Further control tests are still in progress.

ARNAUD (MADELEINE). **Recherches préliminaires sur les champignons entomophytes.** [Preliminary researches on entomogenous fungi.]—*Ann. des Épiphyties*, xiii, 1, pp. 1–30, 2 figs., 2 diags., 13 graphs, 1927.

The author's experiments, which are described in detail, formed part of a series undertaken chiefly at the Station de Pathologie Végétale in Paris to investigate the possible agricultural application of entomogenous fungi in the destruction of harmful insects. Purely exploratory, the experiments, which are as yet incomplete, were mostly confined to *Beauveria bassiana* (formerly known as *Botrytis bassiana*) and to *Beauveria densa* (*Isaria densa*), but some were carried out with *B. globulifera* (*Sporotrichum globuliferum*) and with a species of *Spicaria* allied to *S. farinosa*. The insects employed were chiefly the silkworm (*Bombyx mori*) and the cabbage butterfly (*Pieris brassicae*).

To examine the influence of temperature upon the growth of *B. bassiana* and *B. densa*, potato cultures were used. In both species development was noticeable at about 8° C., while from 9° upwards, growth was rapid. The optimum temperature for *B. densa* was about 22°, and for *B. bassiana* about 28°. Spores remained viable after 24 hours at 40°, but were killed at 45°.

Infection was readily secured on both *B. mori* and *P. brassicae* with the four fungi used, either by placing the insects in contact with sporulating cultures, or by sprinkling them or the leaves they ate with spores. *B. bassiana* proved the most active. The larvae of wireworms (*Agriotes*) resisted infection for a long period.

Further experiments, in which silkworms were infected by being placed for a moment in contact with a culture of the fungus, and then placed in a Petri dish, showed that a damp atmosphere favoured infection if not prolonged beyond 24 hours. If the insects are kept continuously in damp conditions the action of the fungi is less rapid. It appeared probable that the organisms studied can penetrate the outer skin of insects; they certainly emerged through the chitin of infected caterpillars.

Cultures made from a single isolation of *B. bassiana* and main-

tained during more than two years on an artificial medium, with numerous transfers, did not appear to become reduced in virulence.

SHEAR (C. L.). **Mycology in relation to human pathology.**—*Amer. Naturalist*, lxi, 673, pp. 151–159, 1927.

The author draws attention to the increasing importance given to fungi in human pathology and emphasizes the need for more adequate facilities for their investigation. Two distinct problems are involved in the study, one concerning the origin, identity, and life-history of the organism and the other its pathogenicity, which in many cases is obscure. The taxonomic confusion arising from the use of different systems of nomenclature by mycologists and medical pathologists is discussed and a closer co-operation between these two groups of workers advocated. Brief reference is made to the most important literature and the necessity for a summarization of our present knowledge indicated. The maintenance of pure culture supply laboratories, such as that already established at the McCormick Institute, Chicago, should prove of great value in the study of these problems.

HARRIS (J. W.) & BROWN (J. H.). **Description of a new organism that may be a factor in the causation of puerperal infection.**—*Bull. Johns Hopkins Hospital*, xl, 4, pp. 203–215, 3 figs., 1927.

Clinical details are given of the symptoms of puerperal infection associated in six cases with the presence of an organism closely resembling *Actinomyces necrophorus*, for which the name *A. pseudonecrophorus* is proposed. A bacteriological study of the latter was made and its pathogenicity for animals tested. *A. pseudonecrophorus* differs from *A. necrophorus* in being non-haemolytic when grown on the blood-agar plate and in failing to ferment lactose. The two organisms do not cross-agglutinate in immune sera. *A. pseudonecrophorus* appears to be less injurious to human beings than *A. necrophorus* is to animals, and it was also less pathogenic in the above-mentioned laboratory tests on rabbits, guinea-pigs, and white mice. The strictly anaerobic character of the organism probably accounts for its having been so long overlooked.

D'EWART (J.) & DAWSON (G. D.). **Actinomycosis in the brain of a child.**—*Brit. Med. Journ.*, 3458, pp. 718–719, 1927.

A post-mortem examination of the brain of a boy aged eleven revealed the presence of actinomycetic lesions. The base of the lungs, the liver, and spleen were also slightly affected, and it is suggested that the disease may have originated in the gastric region. Infection may have been contracted by handling straw from banana crates. This case is regarded as of considerable interest in view of the great rarity of cerebral actinomycosis in children.

FORCONI (G.). **Una dermatomicosi umana da ifomicete esotico.** [A human dermatomycosis produced by an exotic Hyphomycete.]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, i, 8–9, pp. 515–517, 1927.

A young woman working at the Botanical Institute of the Uni-

versity of Siena contracted an infection of the little finger of her right hand, due to *Microsporon ferrugineum*, cultures of which had been procured from the East for purposes of investigation. The symptoms of the affection are briefly described, and attention is drawn to the lengthy period (one year) which elapsed between the handling of the cultures by the patient and the development of the irritation on the finger.

LEGENDRE (J.). **A propos de la dermatite blastomycosique chéloïdienne.** [On the subject of cheloid blastomycetic dermatitis.]—*Bull. Soc. Path. Exot.*, xx, 4, p. 323, 1927.

From the account given by Montel and Pons of the case of cheloid blastomycetic dermatitis observed by them in Cochin China [*R.A.M.*, vi, p. 293], the writer feels confident that the disease was caused by *Blastomyces tonkini*, which he described and figured in the *Bull. Méd.-Chirurg. de l'Indo-Chine* for September, 1911. Rapid cures were effected in two cases of the disease in Europeans by treatment with large doses of potassium iodide.

GAMMEL (J. A.). **The etiology of maduromycosis with a mycologic report on two new species observed in the United States.**—*Arch. of Dermatology*, xv, 3, pp. 241–284, 20 figs., 1927.

The term maduromycosis was evolved in 1916 by Chalmers and Archibald (*Ann. Trop. Med.*, xvi, p. 169, 1916) for those forms of mycetoma possessing grains composed of large segmented hyphae with well-defined walls and usually with chlamydospores. A review of the literature shows that 17 species of moulds belonging to different genera have been implicated in the etiology of the condition, namely, 6 species of *Madurella*, 3 of *Indiella*, 2 each of *Glenosporium* and *Scedosporium*, and 1 each of *Allescheria*, *Aspergillus*, *Sterigmatocystis* [*Aspergillus*], and *Penicillium* [cf. *R.A.M.*, vi, p. 485].

The former classification of mycetoma, according to the colour of the grains, is regarded as of little scientific value, since it has been shown that grains of the same colour may be produced by different genera of fungi. Further subdivisions of the maduromycoses should be based on mycological data, the conditions being classified as madurellamycosis, indiellamycosis, and so on, according to the causal organism.

All these fungi produce in the human or animal body grains composed of hyphae, sometimes with chlamydospores. In old cultures and under unfavourable conditions most of them form simple sclerotia more or less resembling the grains observed in the patient. Knowledge of the mycology of most of the organisms is still limited and their classification and nomenclature are as yet only provisional.

Four of the six maduromycoses hitherto reported in the United States were of the black grain variety and two are attributed to new species of *Madurella*, to which the names *M. americana* [ibid., v, p. 429] and *M. ikedai* have been given. The latter, isolated from a maduromycosis with black grains in Minneapolis, is characterized by a greyish-white to light brown mycelium with

hyaline or subhyaline, rarely granular hyphae, varying in diameter from 1·5 to 5 μ.

SEVCIK (F.). **Étude expérimentale sur l'immunité et l'allergie consécutives à la teigne herpétique dans l'espèce bovine.** [Experimental study on consecutive immunity and hypersensitivity to herpetic ringworm in the bovine species.]—*Comptes rendus Soc. de Biol.*, xcvi, 13, pp. 1092–1093, 1927.

Experiments were conducted at the Veterinary College at Brno [Brünn], Czecho-Slovakia, to ascertain the reaction of oxen to cultures of *Trichophyton neo-endothrix vulgare* and *T. ectothrix faviforme album*, both isolated from herpetic lesions. Positive results were obtained by intracutaneous inoculations on oxen and guinea-pigs, but not on dogs and rabbits. The incubation period lasts from eight to ten days. Spontaneous recovery from the affection produced by *T. neo-endothrix vulgare* occurred in 65 days (90 days in one instance), and in 45 days in the case of *T. ectothrix faviforme album*. A purely local immunity was conferred by the inoculations. Convalescent animals were hypersensitive to intracutaneous inoculation with trichophytines [*R.A.M.*, iv, p. 91], marked swellings being produced in the healed areas. Horses reacted similarly to the administration of trichophytines.

QUINLAN (J.) & DE KOCK (G.). **Two cases of rhinosporidiosis in equines.**—*South African Journ. of Science*, xxiii, pp. 589–594, 3 pl., 1926. [Received August, 1927.]

Tumours set up by *Rhinosporidium* in human beings have been described by various writers [*R.A.M.*, iii, p. 153], and in 1906 one was recorded in a horse in South Africa. The two cases described in this paper appear to be the only others since found on equines in the country.

Examination of the first animal, a mule, revealed tumours on the regia respiratoria of the nasal chambers. The mass of the tumour was of the nature of a granuloma, embedded in which were numerous cysts of *Rhinosporidium*. The second case was also in a mule, which bore a circumscribed rounded swelling on the medial aspect of the near hind limb and, in addition, had the left nostril almost filled with a mass of pale red granulations. No cysts or spores were found in the tumour on the leg, but that in the nose contained scattered *Rhinosporidium* cysts embedded in the epithelium and larger numbers in the deeper tissues. Most of the cysts were about 80 μ in diameter but they varied from 40 to 160 μ. After removing the tumour on the leg a new growth occurred, but when this and the nasal tumour were subsequently removed there was no recurrence after 13 months.

REDAELLI (P.). **Sul procedimento diagnostico per la determinazione specifica di fermenti e pseudofermenti asporigeni.** [On the diagnostic procedure for the specific determination of non-sporing yeast-like fungi.]—Reprinted from *Boll. Soc. Medico-Chirurgica di Pavia*, N.S., ii, 2, 34 pp., 3 figs., 1927.

The author emphasizes the necessity for a combined morphological, cultural, biochemical, and pathogenic study of the non-

sporing yeast-like fungi, such as *Cryptococcus, Candida, Torula, Mycoderma*, and the like, if their correct determination is to be made. Previous determinations have frequently been based wholly on morphological characters, but the insufficiency of this system is evident from numerous examples, whereas the amplified method adopted by the author in conjunction with Ciferri is claimed to have resulted in clearly defining the new group of Torulopsidaceae [*R.A.M.*, v, p. 229]. This procedure, which has since been modified and completed, will be published in detail in due course. In the present paper the author limits his observations to a criticism of the comparatively inadequate methods followed by Pollacci and others who have concerned themselves with the human pathogens of this group. *Cryptococcus hominis* cultivated only on a standard medium (Pollacci) produced round or oval cells, measuring 4 to 10 μ and propagated by simple budding, without mycelium or chain formation. Grown by the author on a variety of substrata, however, it showed chains of cells arising from a central rounded cell, and also a fine, branched mycelium with hyphae divided into short segments, 30 to 40 μ in length. In a similar way, *Endomyces pulmonalis*, which is reported to produce only chlamydospores on standard solid media, could be got to form chains (simple or budding), suggestive of the genus *Candida*, in liquid media.

Admitting that the biological characters of these forms vary considerably, the author emphasizes the value of biochemical experiments in bringing out the stability of the different characters in relation to the environment. Various cases are cited which illustrate the stability of the fermentative activity of a given species. The biochemical function of the fungus should also be studied in relation to carbon and nitrogen assimilation.

YENDO (Y.). **Investigation of the rusty brown discoloration of silk fibres caused by microorganisms.**—*Bull. Uyeda Silk Tech. Coll.*, i, 81 pp., 13 pl., 2 figs., 1926. [Abs. in *Japanese Journ. of Botany*, iii, 3, p. (74), 1927.]

Bacteria and fungi were constantly isolated from discoloured cocoons, raw silks, frisons, and other waste silk material subjected to defective methods of treatment or storage. Two species of bacteria, S and M, the former belonging to the *Bacillus subtilis* and the latter to the *B. mesentericus* group, were found to be responsible for the brown discoloration. Both are widely distributed in nature, but their main source is the straw in which the cocoons are spun. The bacteria from the straw infect the cocoons and cause their discoloration through rapid reproduction in the moist, warm atmosphere. Moreover, the organisms produce heat-resistant spores which enable them to survive the processes of drying, cooking, reeling, and the like, and they continue to develop on raw silks, boiled cocoons, frisons, &c.

Eight kinds of fungi, viz. *Aspergillus glaucus, A. glaucus* var. *α, A. glaucus* var. *β, A. fumigatus, A. albus, Penicillium commune*, and *P. brevicaule* were detected as the chief organisms causing a brown discoloration of cocoons and waste silk [*R.A.M.*, v, p. 739]. The attacks of these organisms result not only in the discoloration but also in the weakening of the fibres on account of decomposition.

The discoloration is due to the production of a brown pigment, melanin, through the oxidation, by tyrosinase, of tyrosin, which is derived from the decomposition of the protein substances (especially sericin) of the silk, by the proteolytic action of an enzyme secreted by the micro-organisms. The sole means of prevention of the discoloration is to arrest the development of the bacteria and fungi.

OCFEMIA (G. O.). **Second progress report on bunchy-top of Abacá or Manila Hemp.**—*Phytopath.*, xvii, 4, pp. 255–257, 1 fig., 1927.

In this second report [*R.A.M.*, vi, p. 174] the author records observations made on bunchy top of abacá [*Musa textilis*] in the Philippine Islands, after transference of the disease by the aphid *Pentalonia nigronervosa* under controlled conditions. He notes the following sequence of symptoms: the appearance of indefinite chlorotic areas on the margin of the youngest leaf, the curling of the leaf margin, the appearance of delicate transparent membrane-like areas on the chlorotic portion of the leaf, browning, and finally rotting from above downwards. He is of the opinion that in bunchy top infected areas at least, heart rot [ibid., vi, p. 359] may be the final stage of that disease.

A similar bunching of the leaves of abacá, but with no chlorotic symptoms or malformations, is caused by the abundance of nematode galls in the roots, the rotting of the roots by various soil fungi, and close planting.

SALMON (E. S.) & WARE (W. M.) **Leaf scorch of Azalea.**—*Gard. Chron.*, lxxxi, 2104, pp. 286–288, 5 figs., 1927.

After recapitulating Flachs's paper on leaf scorch of azaleas (*Septoria azaleae*) in Germany [*R.A.M.*, v, p. 613 and next abstract], the writers describe the occurrence of the same disease in some nurseries at Hythe. The affected plants, which had arrived from Belgium in September, 1926, showed the typical brown discoloration and black spotting of the leaves when examined in the following March. The varieties most severely attacked were Prés. Osw. de Kerchove, Ern. Eeckhaute, and Madame Petrick, which were almost completely defoliated.

The pycnidia, which are embedded in the leaf tissue below the cuticle and outer epidermal wall, measure approximately 100 to 145 μ in diameter, and the hyaline, 1- to 4-septate, oblong-linear spores, 11 to 34 by 1·5 to 2·5 μ (average 19 by 2 μ). The hyphae of the fungus were found spreading through the leaf tissues and accumulating so densely in parts of the mesophyll, near the vascular bundles, that they appear to form sclerotia. The spores germinated readily in water and produced small secondary conidia, measuring 7 to 11 by 2 to 3 μ.

In all probability the disease was already established on the plants when they arrived, and therefore the question of prevention by spraying did not arise. The immediate destruction of infected material and the provision of adequate ventilation should suffice to arrest any attack of leaf scorch at an early stage.

PAPE (H.). **Eine gefährliche Blattfleckenkrankheit der Azaleen.** [A dangerous leaf spot disease of Azaleas.]—*Gartenwelt*, xxxi, 6, pp. 86–88, 2 figs., 1927.

Azaleas in Germany have been suffering for some years from a serious fungous disease characterized by the occurrence on the leaves of yellowish (later very dark brown), irregular, round or angular spots. The lesions, which originate at the tips or margins and are often sharply delimited by the larger veins, penetrate the entire thickness of the tissue but are most prominent on the pale under side of the leaf. Diseased leaves fall prematurely, and after several years of infection the lateral branches become long and thin and lose many of their buds.

Microscopic examination of the affected tissues reveals the hyaline, septate hyphae and small black pycnidia, containing elongated, cylindrical, often curved, hyaline, finely granular spores, measuring 30 to 40 by 1·5 to 2·5 μ, of *Septoria azaleae* [see preceding abstract]. The writer detected the disease in a consignment of azaleas from Burg (near Magdeburg) in March, 1926, and in several commercial nurseries in the vicinity of Berlin between November, 1926 and January, 1927.

Control measures should include the application of a standard fungicide during the dormant and growing periods, and the removal of all infected material.

NAUMANN (A.). **Bekämpfungsmassnahmen gegen 'Septoria azaleae'.** [Control measures against *Septoria azaleae*.]—*Blumen- und Pflanzenbau*, xlii, 3, p. 32, 1927.

Before the outbreak of war in 1914 the writer obtained successful control of *Septoria azaleae* [see preceding abstracts] by repeated immersion of the plants in a preparation known as tenax. In 1924 his attention was again called to the extensive occurrence of this disease at Pillnitz (Saxony). The results of preliminary tests indicate that good control may be effected by five applications of 1 per cent. Burgundy mixture given between June and September. The writer further recommends soil disinfection with the same preparation as a valuable supplementary measure.

BUISMAN (CHRISTINE J.). **Een wortelziekte van Calla, veroorzaakt door een Phytophthora-soort.** [A root disease of *Calla* caused by a species of *Phytophthora*.]—*Tijdschr. over Plantenziekten*, xxxiii, 2, pp. 17–22, 1 pl., 2 figs., 1927. [English summary.]

This is a preliminary account of the root rot of Calla lilies (*Richardia*) [*Zantedeschia aethiopica*] caused by *Phytophthora richardiae* in Holland, fuller particulars of which have already been noticed from another source [*R.A.M.*, vi, p. 380].

SALMON (E. S.) & WARE (W. M.). **Root rot of Richardia.**—*Gard. Chron.*, lxxxi, 2101, pp. 234–235, 4 figs., 1927.

After resuming the chief points of Miss Buisman's paper on the root rot of Calla lilies (*Richardia*) [*Zantedeschia aethiopica*] in Holland [see preceding abstract], the writers describe a similar disease occurring in a Berkshire nursery. The fungus isolated from the infected material was a species of *Phytophthora* agreeing

closely with *P. richardiae*. The sporangia measured 52 by 33 μ and the zoospores (usually about eight in a sporangium) 16 to 18 by 10 to 12 μ (oval) or 14 to 16 μ (globular). After discharge, proliferation of the bearing hypha into the emptied sporangium occurs, a new sporangium being formed within the walls of the first or occasionally at some distance above the latter, in which case the stalk may branch and bear several sporangia. Very numerous smooth, thick-walled, round oospores, measuring 14 to 20 μ, were observed in newly attacked roots, but it is not yet certain whether they are connected with *P. richardiae*. The disease was also found at a nursery near Folkestone.

PAPE (H.). **Die Brennfleckenkrankheit der Orchideen.** [Anthracnose of Orchids.]—*Gartenwelt*, xxxi, 13, pp. 191–192, 3 figs. (1 on p. 190), 1927.

Anthracnose of orchids, associated with various species of *Gloeosporium* and *Colletotrichum*, including *G. oncidii*, *G. affine*, *C. orchidearum*, and *C. orthianum*, is stated to be responsible for heavy damage in German orchid houses [*R.A.M.*, v, p. 429]. The leaves develop circular or oval, somewhat depressed, sharply delimited lesions, measuring up to 1 or 2 cm. in diameter and frequently coalescing. The colour of the spots, which are usually surrounded by a dark zone, varies with age from dark reddish-brown or nearly black to light brown or grey. The pseudobulbs may be similarly affected and destroyed in severe cases. Minute dark pustules, exuding pink or yellowish oily drops under damp conditions, appear in concentric circles on old spots and give rise to innumerable conidia.

Infection is favoured by excessive applications of nitrogen, high temperatures and humidity, and insufficient light. Control measures should be based on thorough sanitation and suitable cultural methods, supplemented by repeated applications of Bordeaux or Burgundy mixture.

Brief notes are given on two recent cases of anthracnose in commercial nurseries, *Vanda coerulea* being severely attacked by *G. affine*, and *Coelogyne cristata* by an undetermined species of the same genus.

TAKAHASHI (T.). **A Sclerotium disease of Larkspur.**—*Phytopath.*, xvii, 4, pp. 239–245, 1 pl., 1927.

This paper reports the study of a disease of cultivated larkspurs (*Delphinium* spp.) in the vicinity of Madison, Wisconsin, due to a fungus similar to or identical with *Sclerotium delphinii* [*R.A.M.*, iv, p. 10]. Different types of larkspur show varying degrees of susceptibility. The symptoms include leaf discoloration and wilting, and the whole plant usually dies within a few days. The fungus was isolated and its cultural characteristics on different media studied. Spore formation was never observed. The mycelial characters agree with those of *S. rolfsii*, but the sclerotia of the larkspur parasite are fewer, decidedly larger, usually more flattened, and redder than those of *S. rolfsii* grown under the same conditions. Temperature studies showed that *S. delphinii* can develop at a lower temperature than *S. rolfsii*, and that the growth of the former

varies from little at 10° C. to an apparent optimum at 28° to 30°. The depth of the medium influences the size and number of sclerotia of the larkspur fungus; they are smaller and fewer on a thin substratum. Inoculation experiments proved that *S. delphinii* is pathogenic to larkspur, and to a lesser degree to melon, cucumber, and rice.

NAKAMURA (H.). **On the spot-leaf disease of Callistephus chinensis.**—*Journ. Plant Protection*, xiii, 8 pp., 1 pl., 1926. (Japanese). [Abs. in *Japanese Journ. of Botany*, iii, 3, p. (62), 1927.]

Septoria callistephi Gloyer, the causal organism of leaf spot on *Callistephus chinensis*, has recently been discovered in Japan [*R.A.M.*, v, p. 699]. Its behaviour in nutrient media at different temperatures is described.

OGILVIE (L.). **An important virus disease of Lilium longiflorum and its varieties.**—*Nature*, cxix, 2997, p. 528, 1927.

The writer has shown, by means of controlled experiments in Bermuda, that an important disease (popularly known as 'yellow flat') of *Lilium longiflorum* and its well-known varieties of commerce, *L. giganteum* (*L. longiflorum* var. *takesima*), *L. formosum* (*L. longiflorum* var. *insulare*), and *L. harrisii* (*L. longiflorum* var. *eximium*), belongs to the group of filterable virus diseases, and is transmitted by *Aphis lilii* Takahashi (closely related to *A. gossypii*) [*R.A.M.*, vi, p. 16]. Rigid Government inspection is stated to have reduced the incidence of infection of *L. harrisii* in Bermuda to a minimum.

OGILVIE (L.).—**Notes on Lilies.**—*Agric. Bull. Bermuda Dept. of Agric.*, vi, 4, pp. 4-5, 1927.

The annual inspection of the Bermuda lily [*Lilium longiflorum* var. *eximium*] fields, one of the main objects of which is the elimination of disease, began on 8th March, 1927. The number of 'yellow flat' plants [see preceding abstract] in a given field may not exceed one per cent. Mosaic plants, recognizable by striping, curling, and distortion of the leaves, should also be removed, not more than six per cent. of severely affected plants being allowed. Stocks may be kept free from this disease by marking a number of the most vigorous plants at flowering time and using these exclusively for shelling down. Nicotine solutions, e. g., blackleaf 40, should always be used in combination with the usual Bordeaux sprays, while nicotine dust is also effective.

JUEL (O.). **Några parasiter på Buxus.** [Some parasites on Box.]—*Svensk Bot. Tidskr.*, xx, 4, pp. 493-494, 1926.

Macrophoma mirbelii, also known as *Gloeosporium pachybasium* and by several other names, is stated to be the most common and severe fungous parasite of box (*Buxus*). On the branches it appears as a dark, compact mass which Petrak calls *Sclerophoma confusa*. This fungus is frequently accompanied by *Ditopella vizeana*, which is considered to belong to the Dothideales rather than the Gnomoniaceae, and is possibly the perfect stage of *M. mirbelii*. The conidia

of the latter fungus readily germinated and grew on sterilized box leaves and formed pycnidia in profusion. An abundant mycelium, which developed chlamydospores and subsequently hardened into a dark crust, was formed on plum agar. *Phoma stictica*, isolated from box leaves, was readily cultured on sterilized foliage and on plum agar. Other fungi parasitic on box include *M. candollei* and *Hyponectria buxi*.

POLLINGER (T.). **Die Ursachen der Kleemüdigkeit und deren Verhütung.** [The causes of Clover-sickness and its prevention.]—*Illus. Landw. Zeit.*, xlvii, 16, pp. 211–212, 1927.

The most important cause of clover-sickness in Germany is stated to be stem rot [*Sclerotinia trifoliorum*], which is frequently so severe as to necessitate the ploughing up of entire fields in the spring. No effective control measure is known, and the risk of constant reinfection can only be averted by allowing contaminated land to lie fallow for several years.

WORMALD (H.). **Further studies of the brown-rot fungi. II. A contribution to our knowledge of the distribution of the species causing brown-rot.**—*Ann. of Botany*, xli, 162, pp. 287–299, 1927.

In continuation of his previous studies on the brown rot fungi [*R.A.M.*, i, p. 431 ; ii, p. 547 ; v, p. 435], the writer has examined a number of foreign specimens and cultures of *Sclerotinia* in order to compare them with the organisms causing similar diseases in Great Britain.

A comparison of over twenty strains from Holland, France, Switzerland, Italy, and Russia showed that the two common species occurring in the British Isles (*S. fructigena* and *S. cinerea*) are also widely represented on the Continent. *S. cinerea* f. *pruni*, and probably *S. cinerea* f. *mali* also occur in different European countries. *S. laxa* is considered to be a synonym of *S. cinerea*, but *S. mespili* and *S. cydoniae* are distinct species. *S. fructigena* and *S. cinerea* f. *pruni* are further found in Manchuria and Japan, and the latter, with which Barss's *S. oregonensis* has been found to be identical [ibid., v, p. 108], has also been observed on the Pacific coast of North America. *S. americana*, a name which the author adopts in agreement with Norton and Ezekiel for his *S. cinerea* f. *americana* [ibid., vi, p. 493], has been recorded in various parts of the United States, and in British North America, Australia, and New Zealand. It has also been isolated on one occasion from Bismarck apples in Holland.

It would appear from the above data that *S. fructigena*, which in Europe is the principal cause of decay in apples and pears approaching maturity on the trees and in the early stages of storage, is absent from the fruit-exporting regions of North America, Australia, and New Zealand, while there is no evidence as yet that *S. cinerea* occurs in Australasia. In countries where *S. americana* is present and *S. fructigena* absent the apple crop appears to be little affected by brown rot. *S. cinerea* f. *mali*, which causes a destructive wilt of apples in Great Britain, does not seem to occur in the chief extra-European fruit-growing regions (all the author's

material of this species from North America proving to belong to *S. cinerea* f. *pruni*), though Ezekiel found that two of his strains of *S. cinerea*, isolated from stored apples at Washington, D.C., showed certain cultural features in common with this form. *S. americana*, apart from the single Dutch case referred to above, is apparently unknown in Europe, and great care should be taken to exclude it. For this reason experimental field work with the American fungus cannot be carried out in Europe, but it is desirable that further comparative studies on the morphological characters of *S. americana* and *S. cinerea* should be pursued in the western United States and in British Columbia. In the material examined by the writer the average conidial dimensions of four specimens of *S. americana* were 16·5 by 12·2, 17·2 by 12·3, 14·4 by 9·8, and 13·6 by 9·14, compared with 11·4 by 7·8 and 11·5 by 7·9 μ in two of *S. cinerea*.

BROWN (E.). **Effect of shade on Apple scab.**—*Gard. Chron.*, lxxxi, 2105, pp. 305–306, 1927.

The writer has observed that apple scab [*Venturia inaequalis*] is less prevalent on the fruit of trees of the susceptible Lord Derby and Newton Wonder varieties which are shaded from the sun during a part of the day. Experiments in shading the fruit and fruiting branches only gave negative results, from which it would seem that the beneficial effects of shade are exerted on the growing tree, and not on the fruit itself.

OSTERWALDER (A.). **Der Schorf und seine Bekämpfung.** [Scab and its control.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvi, 7, pp. 116–119, 4 figs., 1927.

A brief, popular description is given of the symptoms of apple and pear scab (*Venturia inaequalis* and *V. pirina*), with notes on the life-history, mode of infection, and control of the causal organisms.

KÖCK (G.). **Kupfervitriolkalkbrühe oder Schwefelkalkbrühe?** [Bordeaux mixture or lime-sulphur mixture?]—*Wiener Landw. Zeit.*, lxxvii, 15, p. 135, 1927.

Doubts have recently been expressed as to the suitability of Bordeaux mixture for the control of scab of apples and pears (*Fusicladium*) [*Venturia inaequalis* and *V. pirina*]. Osterwalder and other workers claim that lime-sulphur is equally efficacious and causes no injury to the foliage, such as is frequently observed after treatment with Bordeaux mixture. Austrian fruit-growers are urged to make comparative trials of the two preparations, and report the results to the plant protection headquarters, since the question is one of extreme importance.

HURT (R. H.) & SCHNEIDERHAN (F. J.). **New methods of bitter rot control.**—*Virginia Agric. Exper. Stat. Bull.* 254, 22 pp., 7 figs., 1927.

Bitter rot of apples (*Glomerella cingulata*) is stated to be one of the most destructive fungous diseases in the Piedmont district of Virginia, where the highly susceptible Pippin variety is grown on

a commercial scale. The symptoms [which are described] generally appear during the first week in July, as a result of infection by spores produced during the June rains on the mycelium overwintering in mummified fruit remaining on the tree, and washed on to those lower down, so that the attack occurs in the form of a cone with the mummy at the apex. Overwintering in twigs is much less frequent, and was first detected (in the Smokehouse variety only) in 1926. Mummies have been found to harbour the bitter rot fungus in an infectious form for two years or more. Their removal, by means of a 10-foot pole with a curved nail in the end, has been found to be a valuable and practical mode of control when supplemented by two applications of Bordeaux mixture (3–5–50) five and seven weeks, respectively, after petal fall, and the weekly removal of infected fruits.

An analysis of weather data from 1923 to 1925 showed approximately 13 days in each year favourable to bitter rot infection, with an average interval of about five days between the periods of infection. Spores were produced by mummies for a total period of 37 days in 1925 and 72 days in 1926. Rain is necessary for the liberation of the spores, the minimum period being about five hours, while a ten-hour period was essential for heavy infection under the most favourable laboratory conditions.

KIDD (F.) & WEST (C.). **The storage life of Apples in relation to respiratory activity and chemical composition. A relation between the respiratory activity and the keeping quality of Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the years 1925, 1926,* pp. 37–41, 5 graphs, 1927.

The authors have studied the relation between the respiratory activity and the keeping qualities of apples on samples of the Bramley's Seedling variety grown respectively on fenland, silt, and gravel soils. The wastage in storage at 1° C. was due entirely to internal breakdown, not to fungal rotting [*R.A.M.*, iv, pp. 172, 226].

The keeping qualities were found to be in inverse ratio to the respiratory activity of the apples. Those grown on silt had the longest storage life and the lowest respiratory rate; on the other hand, those grown on fenland, which had the highest respiratory rate, had the least longevity.

The same general relation was found to exist in samples kept at 12° C., though in this case the wastage was due to fungal rotting.

KIDD (F.) & WEST (C.). **A relation between the concentration of oxygen and carbon dioxide in the atmosphere, rate of respiration, and length of storage life in Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the years 1925, 1926,* pp. 41–42, 1927.

In further experiments on the keeping qualities of apples in storage [see preceding abstract], the authors found that, in samples kept in gas storage [*R.A.M.*, iv, p. 225 and next abstract] at 44·2° to 46·5° F., the respiration was approximately halved and the storage life approximately doubled, as compared with similar samples in air storage.

KIDD (F.), WEST (C.), & KIDD (Mrs. M. N.). **Gas storage of fruit.** —*Dept. Sci. & Indus. Res., Food Invest. Board, Special Rept.* 30, 87 pp., 2 diags., 48 graphs, 1927.

This report records a number of experiments conducted to determine the effects produced upon the rate of senescence of living fruit after picking by varying the amount of oxygen and carbon dioxide in the storage atmosphere. It shows indisputably that an artificial atmosphere, containing less oxygen and more carbon dioxide than normal air, definitely retards the natural ripening processes of certain varieties of apples. The rate of the ripening of the fruit after gathering is directly related to the amount of oxygen in the storage atmosphere, and inversely related to the amount of carbon dioxide therein. Ripening, however, progresses normally towards completion only within a certain range of concentration of both oxygen and carbon dioxide, while abnormal effects follow any continuous exposure to atmospheres containing insufficient or excessive oxygen, or excessive carbon dioxide.

The composition of the storage atmosphere was controlled by merely enclosing the fruit in an air-tight chamber and regulating the ventilation. Storage trials with apples of different varieties were carried out in such chambers during several seasons.

When no attempt was made to control the temperature of the storage atmosphere, atmospheres containing about 10 per cent. of carbon dioxide, with about half the normal value of oxygen, were found most effective. The self-heating of the fruit, however, neutralized the retarding effect of the artificial atmosphere, and the method lost its effectiveness when high temperatures prevailed. In controlled temperature experiments a storage atmosphere of this composition was most effective at about 50° F., approximately doubling the storage life of the apples. The greatest effect of the limited set of atmospheric conditions obtainable by this method may be expected only over a certain range of mean temperature values.

The restricted ventilation used in these experiments entailed a disadvantage, in that the humidity of the storage atmosphere was high, and not under control. The atmosphere of the store, moreover, was stagnant, causing various volatile products to accumulate, to the detriment of the fruit by the causation of scald [*R.A.M.*, iv, p. 172]. Fortunately, these harmful effects can be largely eliminated by the use of odourless mineral oil, applied with the wrapper or with sawdust. This proved an efficient preventive of scald in gas storage.

Internal breakdown is shown prematurely to end the storage life of English apples when the average storage temperature is too low; this disease may also be induced by temporary exposure of the fruit to an excess of carbon dioxide, though this causes no immediately visible injury. Apples that had developed bitter pit before storage, like those which had been exposed to freezing temperatures, were specially liable to subsequent internal breakdown.

It is suggested that new methods should be explored for controlling the composition of the atmosphere of fruit stores on a commercial scale, for regulating its humidity, and for avoiding stagnation.

Facts concerning the behaviour of ships' holds as gas stores when ventilation is deficient are also discussed. In cases where the concentration of carbon dioxide and oxygen reached are favourable and the temperature is within a certain range, apples carried in unventilated holds may keep excellently.

KIDD (F.) & WEST (C.). **The development of internal breakdown in cold stored Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the years 1925, 1926*, pp. 45–47, 2 graphs, 1927.

The authors state that in the literature dealing with internal breakdown, or with diseases that they have classed in the same category [*R.A.M.*, iv, p. 172], there is a tendency to distinguish as two distinct diseases the following conditions found in stored apples: (1) a slight, diffuse browning in the flesh, the tissue remaining firm; (2) a softening of the flesh, with deep browning. The authors point out that these two conditions characterize the earlier and later stages, respectively, of internal breakdown, and merge into one another. In the case of the better keeping apples, however, the former stage may be of such duration as to give rise to an erroneous belief that it constitutes a distinct disease [ibid., v, p. 500].

HORNE (A. S.). **Factors affecting the internal resistance of Apple tissues to fungal attack.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the years 1925, 1926*, pp. 52–53, 1927.

Continuing his researches on the rate of rotting of apple flesh by different fungi [*R.A.M.*, v, p. 308], the author establishes a comparison between the activities of eight more fungi, on the basis of the weight of rotted flesh found in a subcutaneously inoculated sample of Cox's Orange Pippin apples after an arbitrary period of storage. Of these the most active were a species of *Sphaeropsis*, *Fusarium culmorum*, and a species of *Asteromella*. A similar experiment with various artificially produced strains of *Fusarium* showed that these strains differ markedly in rotting capacity when the apples are inoculated under the skin soon after gathering. The author computes that at 3°, as compared with 12° C., less than half the amount of rotting occurred in more than double the time; also, the production of a given amount of rotting in Bramley's Seedling required twice the time demanded for the same amount in Cox's Orange Pippin. Evidence is given showing that there are marked differences from season to season in the resistance of apples from the same orchard to fungal attack.

HORNE (A. S.) & MITTER (J.). **Studies in the genus Fusarium (section discolor) relative to invasion.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the years 1925, 1926*, pp. 54–55, 1 diag., 1927.

Confining themselves chiefly to the investigation of the rotting action of species of *Fusarium* of the section *discolor* on apples, the authors found that all the strains available, comprising *F. sul-*

phureum, *F. sambucinum*, *F. discolor*, *F. culmorum*, *F. polymorphum*, *F. lolii*, and *F. trichothecioides*, differ in morphological and physiological details, and also vary in their rotting powers. Saltation was observed in several cases, the parent strains and saltants sometimes exhibiting greater differences than those apparent between the named species. The saltants differed from their parent strains in their power of overcoming the internal physiological resistance of the apple fruit to fungal attack, the saltant being less virulent than its parent.

W. (E. H.). **Chinese Pears.**—*Arnold Arboretum Bull. Popular Inform.*, Ser. III, i, 2, p. 8, 1927.

The Chinese pear, *Pyrus calleryana*, promises to be of great value to American fruit-growers on account of its virtual immunity from fireblight [*Bacillus amylovorus*: *R.A.M.*, v, p. 107]. Seeds of this species [a description of which is given] have been widely distributed in the United States for use as stocks for garden pears.

SAMUEL (G.). **On the shot-hole disease caused by Clasterosporium carpophilum and on the shot-hole effect.**—*Ann. of Botany*, xli, 162, pp. 375–404, 2 pl., 17 figs., 1 diag., 1927.

After a review of the previous literature on the shot hole disease of stone fruit trees, the writer discusses the problem of the nomenclature of the causal organism, for which the names *Clasterosporium carpophilum* and *Coryneum beijerinckii* have both been widely used. The successive abstriction of a number of spores from one conidiophore, giving the latter a geniculate shape, the formation of sectorial mutants, and the preponderance of single conidiophores in culture are all characters which indicate a closer affinity with the Hyphomycetes (notably *Helminthosporium*) than with the Melanconiaceae. Further evidence in this direction is given by an examination of the stromatic fruiting pustules of the fungus. In the characteristic acervulus of the Melanconiaceae spores are usually formed in considerable numbers before the rupture of the epidermis, whereas in the shot hole fungus they seldom develop from the surface of the stroma until after this stage. These and other considerations lead the author to conclude that the name *Clasterosporium carpophilum* is preferable to *Coryneum beijerinckii* for the shot hole organism. As Aderhold has shown, the specific name *carpophilum* has priority over *beijerinckii*.

The germination of the spores is described, and it is shown that the germ-tubes, which are surrounded by a mucilaginous sheath fixing them to the substratum, are negatively heliotropic, and sometimes exhibit a chemotropic response in the presence of host tissue.

The infection of almond leaves was found to occur by penetration of the cuticle, this being in direct conflict with Parker's data obtained in experiments with apricot and cherry leaves [*R.A.M.*, v, p. 109]. The hyphae grow within, or traverse the cellulose walls, which swell up in the vicinity of the mycelium, probably under the action of enzymes secreted by the parasite. The development of

the fungus in the leaf is slow and scanty, the host cells dying in advance of the hyphae.

The reaction of almond leaves to infection by *C. carpophilum* is described. This is characterized by an increase in size of the cells in a zone in the healthy mesophyll near the destroyed tissue, leading to the occlusion of the intercellular spaces and to the appearance (visible to the naked eye) of a thin water-logged line where the process is active. This change is accompanied by the lignification of a few layers of cells on the inside of this zone; by the disappearance of the chloroplasts, increase of protoplasm, and enlargement of nuclei in the surrounding mesophyll cells, which thus assume meristematic characters; and frequently by a local accumulation of starch. If the moisture supply is abundant at this stage, and the leaf relatively young and active, abscission occurs by the rupture of the epidermis on both surfaces and the dissolution of the middle lamellae between the two cell layers just outside the lignified zone; the infected disc of tissue then drops away. Cell divisions in the meristem usually precede complete abscission, and the cells formed acquire suberized or lignified walls, the margin of the shot hole thus being entirely protected by a layer of wound cork. In the absence of abscission, the meristem cells become suberized, thereby cutting off the infected tissues by a barrier of wound cork which arrests the further extension of the fungus. In this case the tissue quickly dies right up to the barrier, sometimes dropping out if shrinkage occurs. The writer did not observe the dropping out of infected tissue except when there had been a development of new cells in the meristem surrounding the seat of infection. Moisture was found to be an important factor in the occurrence of abscission on wounded cherry-laurel [*Prunus laurocerasus*] leaves.

The possible mechanism of meristem formation round the infected tissue is discussed. No definite evidence could be obtained in support of Priestley's theory of the origin of a cambium across a gradient of hydrogen-ion concentration (*New Phytologist*, xxii, p. 185, 1923), and the mechanism of meristem formation in the cherry-laurel differs considerably from that occurring in cut potato [*R.A.M.*, iii, p. 735].

ROBERTS (J. W.) & DUNEGAN (J. C.). **Peach brown rot and scab.**—*U.S. Dept. of Agric. Farmers' Bull.* 1527, 14 pp., 6 figs., 1927.

Peach brown rot (*Sclerotinia fructicola* [*S. americana*: see above, p. 619] and *S. cinerea*) and scab (*Cladosporium carpophilum*) are briefly described, and are stated to cause heavy annual losses in practically all peach-growing areas of the eastern half of the United States. Fruit, twigs, and leaves may be affected, but the chief injury is to the fruit. The parasites can penetrate the unbroken epidermis of the fruits, those causing brown rot entering more readily through wounds, and particularly through the punctures made by the curculio or peach worm [*Conotrachelus nenuphar*]. The development of brown rot is favoured by moderate temperatures (70° to 80° F.) and by damp weather.

Preventive measures include the removal of sources of infection (the best time for removing the rotted fruits being directly after picking time) as well as the thinning of fruits of heavily laden

trees. The principal method of control is spraying or dusting. Directions for the application of sprays and dusts, together with formulae and methods for preparing them, are given. Bordeaux mixture is not advocated, self-boiled lime-sulphur being preferable [see next abstract]. The respective merits of dusting and spraying are discussed, each being considered to have certain advantages.

SNAPP (O. I.), ALDEN (C. H.), ROBERTS (J. W.), DUNEGAN (J. C.), & PRESSLEY (J. H.). **Experiments on the control of the Plum curculio, brown rot, and scab, attacking the Peach in Georgia.** —*U.S. Dept. of Agric. Bull.* 1482, 32 pp., 1 fig., 4 graphs, 5 diags., 1927.

A mixture of sulphur (6 lb.), hydrated lime (8 lb.), and calcium caseinate (12 oz. to 50 galls. of spray liquid), in combination with lead arsenate (1 lb. to 50 galls.) gave good results in the control of brown rot and scab of peach (*Sclerotinia cinerea* and *Cladosporium carpophilum*) during four years' experiments on the Hiley and Elberta varieties in Georgia. Some injury was caused to the foliage, however, by this method of treatment, especially in 1922. Colloidal sulphur (5 lb. to 50 galls. water) also gave good control of both diseases, but severe burning results when this preparation is used with lead arsenate unless lime is added. Two applications of self-boiled lime-sulphur (8–8–50) were practically as efficacious as three. In each of the four years of the tests, spraying was more effective than dusting against curculio (*Conotrachelus nenuphar*), brown rot, and scab. Dusts containing only 50 per cent. of sulphur were not as satisfactory in the control of these diseases as those containing 80 per cent. In very moist seasons the application, 7 to 10 days before harvest, of a dust composed of 80 per cent. sulphur and 20 per cent. lime is to be recommended.

ALTSON (R. A.). **Memorandum on Panama disease.**—*Journ. Board of Agric. British Guiana*, xx, 2, pp. 88–90, 1927.

In this article evidence is brought forward to show that the Panama disease of bananas (*Fusarium cubense*), which devastated the banana industry of Surinam, has never been recorded in British Guiana. From an examination of departmental reports from 1880 to date it is shown that only four official importations of banana suckers came from questionable sources, and these are shown to be free of suspicion of having introduced the disease.

The only diseases of Musaceous crops reported in the colony are a bacterial disease of plantains [*Musa paradisiaca*] and the Dwarf or Chinese banana (*M. cavendishii*), thought to be the same as the 'moko' disease (*Bacterium solanacearum*) [*R.A.M.*, v, p. 346; vi, p. 496]; the Surinam disease or 'elephantiasis' (?*Ustilaginoidella oedipigera*) which is of little economic importance; and anthracnose of banana fruits (*Gloeosporium musarum*). It is very probable that cases of the bacterial wilt have been mistaken for Panama disease in the past, but the Gros Michel variety, which is so susceptible to the latter, is resistant to *Bact. solanacearum*, and plantains are susceptible to this organism while immune from attack by *F. cubense* [but see ibid., iii, p. 121; iv, p. 210].

GIULIVO (G.). **Il vaiolo dell' Olivo.** [Leaf spot of the Olive.]—*L'Istria Agric.*, vii, 10, pp. 229–230, 1927.

The author states that olive leaf spot (*Cycloconium oleaginum*) is at present very rife in Italy, resulting in a greatly diminished production of olive oil. The symptoms of the disease are noted, and trees growing on plains, or exposed to the north, are said to be most susceptible, as are the lower leaves, which receive least air and light. Careful pruning is recommended, and, as a direct preventive, spraying in spring and again in August with a 1 per cent. Bordeaux mixture, or dusting with 1 per cent. Caffaro powder. If the first spraying is carried out shortly before blossoming, lead arsenate may be added to the copper sulphate mixture as a precaution against the olive moth [*Prays oleellus*].

Syria: fungous diseases of the Pistachio tree.—*Internat. Bull. of Plant Protect.*, i, 3, pp. 38–39, 1927.

According to an official statement from Syria, pistachio (*Pistacia vera*) trees in the Sandjak of Alexandretta and in the region of Aleppo are infected, at an altitude of 520 m., by rust (*Uromyces terebinthi*) and a leaf spot caused by *Septoria pistacina*, which has long been known in South Russia. The latter disease, which also occurs on the mastich (*P. lentiscus*), is characterized by the formation, in early June, of small, black, amorphous dots on the older leaves. The fruit of affected trees falls prematurely, with consequent partial or total failure of the crop. It is thought that infection by *U. terebinthi* predisposes the trees to the attacks of *S. pistacina*. No work has yet been done on the control of these diseases, but growers are advised to apply Bordeaux mixture once in the winter and several times in the spring, while sulphur might also be used against rust at the latter period.

GUYOT (L.). **Le problème actuel des anticryptogamiques. II.** [The present problem of fungicides. II.]—*Journ. d'Agric. Prat.*, xci, 16, pp. 318–320, 1927.

In this paper the writer discusses the possibility of replacing copper in fungicides by a cheaper metal of equivalent toxicity [*R.A.M.*, vi, p. 497]. The work of Kotte on the destruction of the spores of *Plasmopara viticola* by various metallic salts is summarized [ibid., iii, p. 669], and reference is also made to the investigations of Faes and others on the fungicidal properties of zinc [ibid., iv, p. 422]. A mixture of 3 kg. of perocid (which consists of cerium sulphate, the oxides of cerium, neodymium, and lanthanum, with small quantities of those of thorium, calcium, and iron) with 900 gm. of lime in 100 l. of water has been found in Austria to be as effective against *P. viticola* as 1 per cent. Bordeaux mixture. The zinc and copper mixtures now on the market in Austria are also stated to have proved very satisfactory. Used at the rate of 2 per cent. these mixtures were found by Wahl to be equal to a 2 per cent. Bordeaux mixture. Chappaz is said to have shown that a mixture of copper acetate and alkaline polysulphides is equal in efficacy, if not superior, to Bordeaux mixture in the control of *P. viticola*.

SAVASTANO (L.). **La poltiglia solfocalcica 'Formola della Stazione di Agrumicoltura' e l'arboricoltura.** [The 'Citrus Station formula' for the lime-sulphur spray in relation to fruit-growing.]—*Boll. R. Staz.-Sper. di Agrumicolt. e Frutticolt. in Acireale* 58, 21 pp., 4 figs., 1927.

The preparation and method of application of a lime-sulphur spray fluid according to the formula of the Citrus Station in Acireale (Sicily) are described in detail [*R.A.M.*, iii, p. 462] and some of the results obtained with it are recorded.

The 6 per cent. solution is recommended as a summer spray for citrus trees, and the strength can be increased to 8 per cent. in the autumn and 10 to 12 per cent. in the winter. Though chiefly used against scale and other insects it is also effective in controlling the obscure citrus disease known as white rust and also citrus sooty mould [*Limacinia citri*]. Scab [*Fusicladium eriobotryae*] of the Japanese medlar [loquat: *Eriobotrya japonica*] can be checked by an application in December, followed by another in January. If used early it is also effective against various mildews caused by species of Erysiphaceae.

The actual cost of the preparation is stated to be 40 lire per 100 l. In spraying citrus orchards the cost per tree with the 6 per cent. solution works out at about 1·04 lire and with the 8 per cent. solution at 1·20 lire, including labour.

STOVER (N. M.) & HOPKINS (B. S.). **Fungicidal and bactericidal action of selenium and tellurium compounds.**—*Indus. & Engin. Chem.*, xix, 4, pp. 510–513, 2 graphs, 1927.

In a series of experiments [full particulars of which are given] on the fungicidal and bactericidal action of selenium and tellurium compounds, cultures of the chestnut blight fungus (*Endothia parasitica*) were exposed for seven days to the action of solutions of sodium selenite, sodium tellurite, potassium selenite, potassium tellurite, and tellurium acid tartrate in concentrations ranging from 0·05 to 0·0005 normal. Practically no fungicidal action was observed with the above compounds, but selenious acid, lithium selenite, and thallous selenite were quite toxic.

Repeated painting of the twigs with 0·1 and 0·04 solutions of selenious acid failed to control apple blotch [scab] (*Venturia inaequalis*).

In laboratory tests selenious acid and thallous selenite (0·05 to 0·0005 normal) exercised a bactericidal action on the causal organism of pear blight (*Bacillus amylovorus*), but field tests conducted on pear trees for the control of this disease have hitherto given negative results.

HENGL (F.). **Ueber Bezug und Anwendung gifthaltiger Pflanzenschutzmittel.** [Notes on the purchase and application of poisonous plant disinfectants.]—*Allg. Weinzeit.*, xliv, 8, pp. 116–119, 1927.

The most important regulations of the decree of 2nd June, 1925, dealing with the purchase and application of poisonous plant disinfectants in Austria [*R.A.M.*, v, p. 64], are cited. Of interest are the conditions governing the spraying or dusting of various culti-

vated plants. Vines in the open may be treated at any time after the harvest until 10th August of the following year (or in the case of early varieties, until five weeks before picking). Fruit trees may not be treated during blossoming or for five weeks before and during picking. Small fruits may be treated at any time except for five weeks before and during picking. Potatoes and horse-radish [*Cochlearia armoracia*] may be treated at any time during vegetation. Certain species of *Brassica* may only be treated for three weeks after transplanting the seedlings, while others, together with a number of vegetable crops [which are enumerated] may be sprayed or dusted at any period up to five weeks before harvesting.

BAUNACKE [W.]. **Wertvolles pflanzenschutzliches Anschauungsmaterial.** [Valuable illustrations for instruction in plant protection.]—*Die Kranke Pflanze*, iv, 4, pp. 57–60, 17 figs., 1927.

The author awards high praise to a series of seventeen coloured plaques in relief which have been placed on the German market by the United German Plaque Manufacturing Company, Ludwigstrasse 8, Munich [cf. *R.A.M.*, iv, p. 685], and which illustrate a number of insect pests and fungous diseases of crops. On the back of each plaque is described in popular terms the life-history of, and control measures against, the pests included. The plaques have been made to the order of the Reich Ministry for Food and Agriculture and with the scientific co-operation of the Biologische Reichsanstalt. They measure 28 by 22 or 45 by 32 cm. and cost 10·50 and 18·50 R.M., respectively, except for the last series of nine, the set of which costs 38·25 R.M.

SMALL (W.). **Recent work on root disease of economic and other plants in Ceylon.**—*Trop. Agriculturist*, lxviii, 4, pp. 201–212, 1927.

The cause of root disease of economic and other plants in the tropics has generally been considered to be certain fungi found associated with these plants, *Fomes lignosus*, *F. lamaoensis*, *Ustulina* [*zonata*], and species of *Poria*, *Rosellinia*, and *Diplodia*. The presence of one or more of these on a diseased host plant is usually easily established, but further examination of the smaller roots often reveals another fungus, *Rhizoctonia bataticola* [*R.A.M.*, vi, p. 439]. The author puts forward the view that root disease in Ceylon and probably also elsewhere, is due primarily to *R. bataticola* and that the other fungi are merely secondary. He bases this theory on the following evidence. (1) There are cases where the *Rhizoctonia* alone causes disease and death; e.g. tea root disease, and root disease of *Albizzia* and *Grevillea* in Uganda. (2) In recent cases of root disease where any of the above-mentioned fungi were present, *R. bataticola* has been found associated in every case, and the writer doubts if any of the former can be present alone. (3) There is little or no experimental proof of the parasitism of fungi like *Fomes*, *Poria*, etc.; and *Ustulina* and *Diplodia* in inoculation experiments have proved to be the only weak or wound parasites. *R. bataticola*, on the other hand, can be fatally parasitic and actual experimental proof of its parasitism has been gained in the case of

herbaceous plants like beans. Similar inoculation experiments of seedlings and older woody plants are now in progress. (4) In certain cases, where the *Rhizoctonia* and another fungus are both present, there is evidence that the former preceded the latter in time of attack. (5) Observations made on *Hevea* rubber trees dying of root disease associated only with *R. bataticola* proved that the trees left standing showed secondary attacks by *F. lignosus*, *F. lamaoensis*, *Ustulina*, and *Diplodia* after five months, and these fungi were confined to the roots killed by the *Rhizoctonia*. (6) *R. bataticola* attacks the smallest feeding roots, and works upwards towards the collar, killing and poisoning, in advance of its progress, probably by means of a toxin.

The hosts of *R. bataticola* now number about 30 [most of which have been listed in previous notices].

The author extends his theory to other diseases, e. g. die-back of *Hevea* rubber and limes, and stem gumming of *Acacia*, *Grevillea*, etc., and states that on the whole die-back is a symptom of some other trouble, most probably of *Rhizoctonia* root disease.

The wide distribution of *R. bataticola* in Ceylon and other countries may be accounted for according to the author by the spread of spores from the pycnidial stage (*Macrophoma*) [*corchori*] on jute and other plants [ibid., iv, p. 350], and the future methods of control may aim at the destruction of this stage. At present the only measure recommended is to promote the natural health of the plants.

The general appearance of the smaller roots attacked by *R. bataticola* is described, as well as the thin black lines and sclerotia which develop in the wood and bark.

In the discussion which followed the reading of this paper at the Second Agricultural Conference, Dr. Gadd strongly opposed the theory propounded, taking the view that the species of *Fomes* or other fungi mentioned were actually the death-dealing organisms, while the *Rhizoctonia* merely caused a susceptible condition of the host plant enabling the former to strike.

SANFORD (G. B.). **Important soil-borne diseases of crops in Western Canada.**—*Scient. Agric.*, vii, 8, pp. 292–294, 1927.

Owing to the continuous heavy cropping practised in the prairie areas of Western Canada, the part played by soil-borne diseases in reducing the productivity of the land is likely to become as important as it has in the older prairie cultivation of the United States. *Helminthosporium sativum* seems to be the most widespread foot- and root-rotting organism in the Canadian wheat fields, while the 'take-all' disease of wheat (*Ophiobolus graminis*) and similar rots caused by *Fusarium* spp. are also prevalent. A root rot of red clover and lucerne (*Sclerotinia trifoliorum* or *S. libertiana*) [*S. sclerotiorum*: *R.A.M.*, iv, p. 95] has caused considerable damage on the plots at the Manitoba Agricultural College, the University Farm at Edmonton, and the University of Alberta. Another similar but more serious disease of sweet clover [*Melilotus alba*] is known in Saskatchewan and Alberta, but the fungus concerned has not been identified [ibid., iv, p. 290]. Other important diseases of this type common in this part of Canada are *Rhizoctonia* stem

canker [*Corticium solani*] and scab [*Actinomyces scabies*] of potato, and flax wilt [*Fusarium lini*].

The following problems connected with the control of these soil-borne diseases are discussed: the survival of the organisms through one or more seasons either in the soil or on wild or cultivated host plants; the different degree of virulence which strains of the same fungus may possess under identical conditions; the natural resistance of the host plant and the different conditions on which this depends, such as age and soil conditions; and the possibility of seed-borne infection which might lend itself to control by seed treatment. Crop and soil management practices and seed treatment are likely to fail in effecting complete control of diseases of this type, and the breeding of resistant varieties seems to be the only hopeful method of attack.

RAWLINS (T. E.). **Research on viruses causing plant diseases.**—*Science*, N. S., lxv, 1686, p. 398, 1927.

The writer comments on the studies which have already been made on such properties of filterable viruses as longevity, resistance to desiccation and chemicals, and inactivation by certain plant juices, and suggests the following lines of future investigation. (1) The influence of oxygen and of the absence of oxygen. (2) Tests of viruses for tropisms. (3) Cataphoresis of a virus at various hydrogen-ion concentrations, and before and after treatment with other ions. (4) Attempts at the inactivation of a virus by mixing it with colloids of known composition, and at reactivation by methods similar to those used in reactivating rennet (*Zeitschr. Physiol. Chem.*, lxxxii, p. 178, 1912): these may also be applicable to the reactivation of a virus inactivated by plant juices. (5) Attempts at the separation of the causal agent into several components by dialysis or other methods. (6) Tests of the host tissues for compounds often produced by micro-organisms. (7) Attempts at the detection of respiration in the viruses.

RICE (MABEL A.). **The haustoria of certain rusts and the relation between host and pathogene.**—*Bull. Torrey Bot. Club*, liv, pp. 63–153, 9 pl. (1 col.), 1927.

The author gives a valuable discussion of the types of parasitism of various fungi and a list of some of the parasites that are known to produce haustoria, together with an account of the characters of many types of these organs. Her observations of rust-infected tissues indicate that the haustorium is not the sole means whereby the fungus obtains nourishment. The early infection stages of maize rust (*Puccinia sorghi*) [*P. maydis*] show an abundance of intercellular mycelium and well-developed runners with dense contents. This would denote that, before the development of haustoria, the fungus is able to derive some nourishment directly through the host cell walls. Similar conditions have been observed in other rusts. Such data, while not minimizing the importance of the haustorium, modify the current interpretations of its functions. The mature haustorium effects a great increase of surface for absorption, which takes place, at any rate in the unen-

cased organ, through fewer layers than in the intercellular hyphae, since the haustorium penetrates the cell wall.

Little indication of hypertrophy and lobing of the nucleus, which has been supposed to represent phagocytic activity, was found in rust-infected cells.

The stage of development of the sheath round the maize rust haustorium may be regarded as an index of the degree of mutualism effected at the moment by the fungus and its host. In the early stages of the rust growth little reaction is set up by the host and a sheath is rarely formed. At a later period the drain on the resources of the host, expressed by the yellow discoloration of the infected areas, may stimulate the plant to the deposition of cellulose. Capacity for sheath formation would thus become a factor in the expression of immunity.

The author's study of many stages of rust-infected maize and other plant tissues clearly showed the retention of the normal condition in the plastids, which differ little in position and size from those in the healthy cells. The diminished staining capacity observed in the plastids of infected cells is not necessarily of toxic origin.

The 'green island' phenomenon of infected tissue is markedly correlated with specialization in the parasite. Thirteen of the nineteen reported instances of the protracted persistence of chlorophyll in infected tissues are due to rusts, while one of the remainder is associated with a haustorial fungus, *Uncinula aceris*. The stimulation of infected cells to prolonged activity is one of the least understood aspects of parasitism.

It is hardly conceivable that a mutualistic relation actually exists between the rust parasite and its host, but observations on various rusts indicate a reduction or complete absence of toxic action on the part of the former. In such cases the cells of the parasite relate themselves to those of the host in the same way as the heterotrophic and storage tissues of the latter.

The author's investigations lead her to the conclusion that many of the rusts cause little damage to the host except at the time of spore production. It would further seem that, for the Uredinaceae in general, elaborate haustorial development is associated with lack of disturbance in the regions of special metabolism of the host-parasite complex.

A bibliography of ten pages is appended.

BOTJES (J. O.). **Het blauw worden van Aardappelen.** [The blue discoloration of Potatoes.]—*Tijdschr. over Plantenziekten*, xxxiii, 4, pp. 57–96, 2 col. pl., 8 graphs, 1927.

A phenomenon known as blue spotting of potatoes is stated to be on the increase in Holland. The affected tubers, which are practically worthless for culinary purposes, show a bluish-black discoloration of the hilum close under the skin. In severe cases blue, black, or grey markings may also extend through a large portion of the tuber, and in winter a brown discoloration, associated with necrosis of the tissues, is often observed.

The condition occurs regularly in the tubers of plants grown on certain areas, while in other soils the symptoms are absent. Ex-

periments have shown that the potash content of affected tubers grown in soil with little potash is very low, and blue spotting was observed to develop in the tubers of plants showing traces of potash deficiency in their foliage. It was further ascertained that the percentage of blue-spotted tubers can be greatly reduced by the liberal application of potash (up to 1,000 kg. per hect.) to plots in soil with a deficiency of this constituent. The potash may equally well be applied in the form of stable manure as in that of salts. Sodium was also fairly effective in the control of the disease.

Blue spotting can be artificially induced, even in tubers grown on normal soils, by violent shaking or pressure, and the effect is much more pronounced when tubers from plots deficient in potash are subjected to the same treatment. The condition is seldom or never observed before the harvest, developing only some days or weeks later as a result of injury during lifting. Each time the potatoes are handled the risks of blue spotting are increased, and the best method of preventing the spread of this condition is to leave the tubers untouched during the winter.

It is evident from these investigations that a deficiency of potash in the soil, though itself unable to produce blue spotting, renders the tubers more susceptible to injuries from rough handling, which result in the discoloration. The presence of oxygen was found to be essential to the production of the blue colour in tubers injured by pressure or otherwise. Soft-fleshed varieties are more liable to blue spotting than hard ones. Bravo, and in a lesser degree, Eigenheimer and Roode Star, have shown susceptibility to this condition.

[This paper has also appeared as *Verslag en Meded. van het Plantenziektenkundigen Dienst te Wageningen*, 48, 1927.]

SCHANDER [R.]. **Physiologische Untersuchungen an blattrollkranken Kartoffeln.** [Physiological investigations on Potatoes affected by leaf roll.]—*Landw. Versuchs-Stat.*, cv, 3–4, pp. 198–204, 1927.

In this paper the author summarizes the various investigations of other workers on leaf roll of the potato and gives a short description of five clearly defined forms of this disease. These are (1) the true leaf roll, an hereditary disease which may occur in an acute or chronic form and is associated with an accumulation of starch and necrosis of the phloem; (2) leaf roll caused by soil acidity, most evident in the upper part of the plant; (3) leaf roll limited to the margin of the leaf and considered by the author to be a racial peculiarity; (4) *Rhizoctonia* [*Corticium solani*] leaf roll, which begins at the tip of the stem and does not cause the leaves to be entirely rolled, but only curved and reddened; and (5) leaf roll of the tip of the shoot limited wholly to the terminal portion of the stem.

Special reference is made to the interesting evidence adduced by Schweizer [*R.A.M.*, vi, p. 370] that the accumulation of starch in the leaf does not depend on the loss of amylolytic power of the leaf enzymes but on the presence in the tissue of an inhibiting substance. Schweizer's work is briefly reviewed and is considered

to support the author's view that the true leaf roll is dependent on the hereditary characters of the variety and is brought about by an alteration in the chemical equilibrium of the plant that has its origin in the germ and can be called out by growth injuries. Whether virus-like substances play a part in this process is left open by the author.

MURPHY (P. A.) & MCKAY (R.). **Investigations on the leaf-roll and mosaic diseases of the Potato.**—*Journ. Dept. Lands and Agric. Ireland*, xxvi, 4, pp. 295–305, 4 pl., 1927.

The authors' investigations on potato leaf roll and mosaic were continued in 1926 at Glasnevin near Dublin [*R.A.M.*, vi, p. 45]. The theories of Appleman, and Schander and Richter [ibid., v, p. 122], on the relation between the vigour and position of the sprouts and the presence of mosaic and leaf roll diseases of potato were further tested by experiment. The sprout index as calculated by either method failed to distinguish between diseased and healthy plants. Similar negative conclusions resulted from a consideration of the situation of the sprouts. Ninety per cent. of the tubers showed 'apical dominance', irrespective of whether they were healthy or diseased. In two-thirds of the cases where the development was not apical, however, the fungus *Corticium solani* was found to be present, girdling the sprouts and leading to a development of laterals.

The apparent susceptibility of eight varieties of potato to leaf roll was tested on a small scale by planting healthy seed so that each variety was uniformly exposed to infection. It was found that all the varieties behaved similarly, and that the nearer the plants were to the source of infection, the greater was their chance of becoming diseased irrespective of variety.

It has been observed that leaf roll affects certain varieties of potato, e. g. President, much more than others, such as Up-to-Date. Experiments were therefore carried out with a view to determine the percentage reduction in yield in selected varieties. Healthy and diseased plants of the same origin were grown side by side under similar conditions. The results showed that the varieties react differently to leaf roll; for instance, President, which produced a total yield of 2·87 lb. per healthy plant, gave nothing in the second generation when infected, while Up-to-Date plants, which also yielded 2·87 lb. per plant when healthy, gave 2·12 lb. when suffering from leaf roll. Several other varieties also showed differences in the effect of the disease on the yield.

It is evident that certain varieties retain their vigour after infection to a greater extent than others. The effect of the disease does not become cumulatively greater in succeeding years, unless infection with other maladies occurs. The earliest stage of the disease, characterized by rolling and yellowing of the topmost leaves (primary leaf roll), lasts for one season only, and does not appreciably influence the yield except when these symptoms develop early in the season. In the latter case in certain varieties, such as Lochar and President, the disease passes rapidly into the secondary stage in the same season, with a detrimental effect on the yield. Arran Comrade and others show the primary symptoms

less clearly or may never show them at all, under the same conditions, and in such cases the reduction in yield is slight. The reaction depends on the variety and not on the place where it is grown.

Experiments carried out in 1926 gave a clear demonstration of the advantages and disadvantages of the use of immature seed. The conclusion arrived at was that immature seed possesses, in itself, no inherent advantage, and is distinctly inferior to mature seed, except where infection with a serious virus disease is prevalent, when the seed from mature plants is likely to contract a greater amount of disease owing to the longer period during which the plant is exposed to infection. Figures of the yields of plants of healthy British Queen and Kerr's Pink raised from immature and mature seed show a considerable reduction in the former case.

Observations on the extent of spread of leaf roll when healthy plants were grown next to a drill of diseased ones, showed that 87 per cent. of all the infections that took place were confined to the first drill after the infected one, 9 per cent. to the second, and 3 per cent. to the third. No spread to the fourth row was observed.

SOUTHWELL (H.). **Virus diseases of Potatoes and the raising of seed Potatoes in the Irish Free State.**—*Journ. Min. Agric.*, xxxiv, 1, pp. 19–25, 1927.

This is a cursory review, written in popular language, of the work carried on at Glasnevin, near Dublin, by Murphy and McKay, in their investigation of leaf roll and mosaic diseases of the potato, and in the production of seed-tubers free from degeneration diseases [see last abstract].

ESMARCH (F.). **Untersuchungen zur Biologie des Kartoffelkrebses. II.** [Investigations on the biology of Potato wart. II.]—*Angew. Bot.*, ix, 2, pp. 88–124, 1927.

The author has carried out further investigations on the physiological processes associated with the germination of the sporangia of *Synchytrium endobioticum* [*R.A.M.*, v, p. 577].

It was found that the resting sporangia undergo a period of after-ripening prior to germination. The length of this period varies according to the age of the sporangia, the time of their liberation from the host, and, especially, in relation to external factors. Thus drought and deficiency of oxygen retard maturation, while the process was accelerated by the exposure of the cultures to carbonic acid and other chemical compounds found in the soil. A small proportion of the sporangia germinated, after a very brief resting period or none, in the year of their formation. The majority of the remainder ripened during the following year under favourable external conditions, while a few persisted still longer (up to $3\frac{1}{2}$ years) in the resting stage.

The sporangia are capable of germination in the presence of comparatively little moisture (45 per cent. of the water-holding capacity of the soil), but development is more profuse under conditions of increased humidity, with an optimum at 90 to 100 per cent. of the water-holding capacity. Under natural conditions

periodic alternations of drought and moisture do not stimulate germination to a greater extent than a uniformly high degree of soil humidity.

The time required for the ripening of the sporangia in the soil varies according to the oxygen content of the soil atmosphere, which in its turn depends on the structure of the soil, the nature and numbers of soil organisms, the water content, and the nature and thickness of the vegetation layer. The length of time during which *S. endobioticum* persists in the soil, estimated by Schaffnit and Voss (*Zeitschr. für Pflanzenkrankh.*, xxviii, p. 111, 1918) at nine years, should be reinvestigated in the light of these factors.

Tests of the influence of various types of watering showed that the degree of infection is influenced less by the number than by the strength and direction of the soil currents. With the same amount of soil moisture, the attack is more severe when the water is supplied from above (e. g. as rain) than when it comes from below as capillary water. A uniformly high degree of soil moisture is less favourable to infection than alternating spells of dry and wet weather, though, as stated above, this is not so in regard to the germination of the sporangia.

The actual occurrence of infection further depends on the distance from the sporangia of the susceptible organs of the plant. Even at a distance of a few millimetres infection often fails to take place. The limits of the sphere of infection, excluding the conveyance of the sporangia or zoospores by soil insects, are 10 cm. laterally, 10 to 15 cm. upwards, and 15 to 20 cm. downwards in a vertical direction. The zoospores are primarily transported towards the tubers by currents of soil water, their own movements being of little significance in this respect. In the early stages of their journey, the motion of the zoospores appears to be without definite direction: only in the immediate vicinity of the tubers is a chemotactic stimulus probably exerted by the susceptible parts.

Liste der als krebsfest anerkannten Kartoffelsorten. [List of the Potato varieties recognized as immune from wart disease.] —*Wiener Landw. Zeit.*, lxxvii, 19, pp. 173–174, 1927.

This is an official list of the potato varieties recognized by the Austrian Ministry of Agriculture as immune from wart disease [*Synchytrium endobioticum*]. Fifty varieties are enumerated, the source of supply being indicated in each case. The names of the Altmark and Goldperle varieties (both supplied by Paulsen) have been changed to Ada I and Goldappel, respectively.

Wollenweber (H. W.). **Die Wirtelpilz-Welkekrankheit (Verticilliose) der Kartoffel.** [The whorl fungus wilt disease (verticilliosis) of the Potato.]—*Biol. Reichsanst. für Land- und Forstwirtsch. Flugbl.* 84, 4 pp., 3 figs., 1927.

A brief, popular account is given of the symptoms, life-history, distribution, and control of *Verticillium albo-atrum*, the causal organism of wilt disease of potatoes [*R.A.M.*, v, p. 759], which is stated to be responsible for losses of up to 50 per cent. in some German crops. In one experimental field 70 out of 100 varieties were found to be infected. Among the comparatively resistant

varieties may be mentioned the Professor Wohltmann group (including Fürst Bismarck), Jubel, Topaz, Bojar, Paulsen's Goldperle [Goldappel: see last abstract], and Ödenwälder Blaue. The fungus may be destroyed by steam sterilization of the tubers (20 hours' exposure to a temperature of 44·5° C.), but this method is not adapted for use on a commercial scale. The roguing of diseased plants during the summer and destruction of infected material after harvest are recommended.

ESMARCH (F.). **Wie verschafft man sich einwandfreie Saatkartoffeln?** [How does one procure sound seed Potatoes?]—*Die Kranke Pflanze*, iv, 4, pp. 1–4, 1927.

The author advocates the purchase of seed potatoes in accordance with the terms of the so-called Berlin agreement of 1926 of the potato trade, drawing special attention to paragraph 8, which includes the following provisions. Merely a price reduction is warranted if 4 per cent. of the potatoes reveal disease externally or when cut, and if the tubers be damaged; but if this percentage be exceeded, the purchaser may refuse to accept delivery. Objection may only be raised to the presence of a slight amount of scab [*Actinomyces scabies*] or sprain if the purchase contract specially rules them out. The detection of wart disease [*Synchytrium endobioticum*] always justifies refusal to accept delivery.

Directions are given for the recognition of the various diseases likely to be present in seed tubers.

HASLER (A.). **Konservierung von Kartoffel-Pflanzgut.** [Preservation of seed Potatoes.]—*Pflanzenbau*, iii, 20, pp. 320–321, 1927.

The author conducted an experiment in 1926 to ascertain the effect of storage in different types of sacks on the incidence of disease in potatoes. The tubers were placed (*a*) in sacks dusted with basic slag and (*b*) in ordinary jute sacks, on 10th April, and examined a month later. The tubers in the dusted sacks showed only 1·17 per cent. wet rot compared with 18·45 per cent. in the ordinary jute sacks. The plants grown from the tubers in the dusted sacks proved superior throughout their development to those from the other lot and gave an increased yield of 18 cwt. per 0·25 hect.

NISIKADO (Y.). **Studies on the Rice blast disease.**—*Japanese Journ. of Botany*, iii, 3, pp. 239–244, 1927.

In a previous paper (*Ber. Ōhara Inst. Landw. Forsch.*, i, p. 171, 1917), the author adopted the name *Piricularia oryzae* for the rice blast fungus [*R.A.M.*, i, p. 343] and *P. grisea*, *P. setariae*, and *P. zingiberi* for the allied organisms occurring, respectively, on *Panicum sanguinale*, *Setaria italica* and *S. viridis*, and *Zingiber officinale* and *Z. mioga*. The results of a series of cross-inoculation experiments [presented in tabular form] now show that each of the above-mentioned species, together with *P.* spp. from *Panicum miliaceum* and *Eriochloa villosa*, respectively, only infects its own hosts.

The optimum temperature for the mycelial growth of *P. oryzae*, *P. setariae*, and *P. grisea* was found to be 26° to 28° C., while *P.*

zingiberi developed best at 23° to 24°. The maximum for the three first-named species is 36° to 37°, and that for the last 34° to 35°. The minimum temperature for the growth of all the species studied is 8° to 9°, and the thermal death-point 51° to 52°.

Most of the strains of *P. oryzae* grew on media with a hydrogen-ion concentration between P_H 5 and 10. The highly pathogenic strain Ehime B began to grow at P_H 4·4. *P. setariae* behaved similarly to *P. oryzae* in culture. The viability of the *Piricularia* cultures extended over a period of more than 400 days. In a dry state the spores of *P. oryzae* lived from the autumn till the next summer, and those from the previous crop may well constitute a source of early infection. When attached to the surface of the rice glumes, the spores of *P. oryzae* may be readily killed with rather dilute fungicides, but the destruction of the mycelium within the tissues of the culm nodes or of the grains presents great difficulties.

Severe outbreaks of rice blast usually occur on the foliage on the resumption of fine weather in June or July following a protracted damp, cool spell. The ears, especially the necks, become affected during cool, rainy weather at the flowering season in September. The excessive use of green manures, e.g., *Astragalus sinicus*, has been found to favour leaf blast on heavy soils, and the 'rotten neck' condition on sandy ground. The author has obtained beneficial results from the application of superphosphate and the addition of lime, gypsum, or calcium carbonate to the manures. Drainage of sandy soils was found to increase rather than retard the development of the disease.

The results of inoculation tests on some 430 varieties of cultivated rice showed that none was entirely immune, though over 30 [which are enumerated] are highly resistant. No constant correlation was found between resistance and the P_H value of the leaf juice of the plants, though in some cases there was an indication that acidity is a determining factor in this connexion.

SCHWEIZER (J.). **Sclerotium rolfsii Sacc. en Rhizoctonia solani op Indigofera endecaphylla.** [*Sclerotium rolfsii* Sacc. and *Rhizoctonia solani* on *Indigofera endecaphylla*.]—*Arch. voor Rubbercultuur*, xi, 4, pp. 150–154, 2 pl., 1927.

Indigofera endecaphylla and *I. hirsuta* at the Bosoeki Rubber Experiment Station (East Java) recently showed the typical symptoms of infection by *Sclerotium rolfsii*, which was readily isolated from diseased plants. Inoculation with sclerotia from *I. hirsuta* gave positive results on both varieties, *I. hirsuta* being the more severely attacked. It is thought that infection spread to the area under *I. endecaphylla* from a small plot of *I. hirsuta* in the cover crop garden at the back of the Station. A species of grass growing near the infected base of an *I. hirsuta* plant contracted the disease, which is known to occur also on the valuable green manures, *Crotalaria usaramoensis* and *Mimosa invisa*.

I. endecaphylla was further found to show the typical symptoms of the *Rhizoctonia* disease of *Vigna* [*R.A.M.*, v, p. 652]. Inoculation experiments with *R.* [*Corticium*] *solani* isolated from diseased plants gave positive results on *V. hosei* [*V. oligosperma*] and both species of *Indigofera*, the first-named being completely destroyed

while the latter were comparatively mildly attacked. The fungus was reisolated from *V. oligosperma* and inoculated into *I. endecaphylla* with positive results. *S. rolfsii*, isolated from *I. endecaphylla*, caused heavy infection on *V. hosei*, while in this case also the two species of *Indigofera* were less severely attacked. The hyphae of a third fungus, probably belonging to the group of sterile mycelia, were also found on the leaves of *I. endecaphylla*.

So far little damage has been caused to the *I. endecaphylla* crops by the organisms under discussion, but attention is drawn to the necessity of keeping a close watch on further developments in regard to this very promising cover crop.

Java's rapid increase in sugar production through new varieties of Cane.—*Planter and Sugar Manufacturer*, lxxviii, 15, p. 282, 1927.

In 1882 the sugar-cane in Java was attacked by a new disease, causing a resemblance to 'sereh' grass (*Andropogon schoenanthus*), which prevented the stalks from maturing and thus reduced the sugar yield. Cuttings grown in the mountains and transplanted to the lowlands proved resistant to this 'sereh' disease [*R.A.M.*, vi, p. 379]. In 1921 a new cane variety was developed at Pasoeroean, and by interbreeding, several strains immune from sereh disease were produced, with a sugar yield larger than that of the older varieties by from 15 to 40 per cent. In 1926, 1,700 bouws [1 bouw = nearly $1\frac{3}{4}$ acres] were planted to 2878 POJ, and in the current year 30,000 bouws have been planted. It is hoped by 1928 to plant 100,000 bouws or 40 per cent. of the area under sugar-cane in the district, and by 1930 this area, which has normally yielded 32,000,000 piculs [1 picul = about 136 lb.] of sugar, is expected to yield an additional 6,400,000 piculs. This will mean a saving in cost of growing and transport from the hill nurseries of some $5,000,000 to the planters, but the probable total destruction by about 1931 of the hill nursery industry, 25 per cent. of the cuttings from which remained unsold in November, 1926.

Legislative and administrative measures. Italy.—*Internat. Bull. of Plant Protect.*, i, 3, pp. 41–43, 1927.

As from 1st May, 1927, the importation into Italy from abroad of live plants, parts of plants, seeds, and other plant products, destined for propagation and reproduction, can be made only through certain points of entry which are indicated. The importation of citrus plants and their parts (except fruits) is permitted after quarantine as defined in Regulation No. 723 of 12th March, 1926, subject to official inspection for freedom from exotic parasites. The same regulations apply in the case of fruit-bearing plants and their parts (except fruits from the countries mentioned under (3) below).

Importation and transit of the following plants or parts of plants is suspended: (1) cuttings and rooted cuttings of European and American vines from France, Spain, the United States, and Canada, on account of black rot (*Guignardia bidwellii*). (2) Plants, bark, branches and trunks covered with bark, fruits, and seeds of chestnut from North and South America, China, and the Far East, as

well as from all countries which have not taken precautionary measures against canker (*Endothia parasitica*). (3) All kinds of fresh fruit from Canada, the United States, Chile, Hawaii, Japan, China, Australia, South Africa, and Argentina, on account of *Diaporthe perniciosa*. (4) Citrus fruits and fresh peel of these fruits from all foreign countries, to guard against *Bacterium* [*Pseudomonas*] *citri*, *Corticium salmonicolor*, *Sphaeropsis tumefaciens*, and *Gloeosporium limetticolum*. (5) Potato tubers, and the fruits and green parts of all kinds of Solanaceae from all foreign countries, on account of wart disease (*Synchytrium endobioticum*). (6) Banana and pineapple plants and fruits, in view of *Fusarium cubense* and *Thielaviopsis paradoxa*. (7) Whole almond fruits, on account of *Ascochyta chlorospora*.

A similar decree (13th September, 1926) as regards vine, chestnut, and potato has been applied to Lybia (p. 43).

Canada Department of Agriculture Destructive Insect and Pest Act Advisory Board. Regulations under the Destructive Insect and Pest Act P. C. 717.—Regulation No. 3 (Foreign) 3rd Revision.—1 p., 1927.

As from 20th April, 1927, the Azores Islands are added to the list of places from which the importation of potatoes into Canada is prohibited on account of wart disease (*Synchytrium endobioticum*) [*R.A.M.*, iii, p. 752]. As heretofore, shipments of potatoes from Pennsylvania, West Maryland, and Virginia must be accompanied by a duly authenticated certificate of freedom from infection.

Canada Department of Agriculture Destructive Insect and Pest Act Advisory Board. Regulations under the Destructive Insect and Pest Act P. C. 717.—Regulation No. 8 (Foreign) 2nd Revision.—1 p., 1927.

As from 20th April, 1927, Regulation No. 8 for the control of white pine blister rust [*Cronartium ribicola*: *R.A.M.*, iii, p. 239] is amended to permit the importation into Canada of the fruits of red and white currants in addition to those of the gooseberry, and of plants, grafts, or cuttings of standard commercial varieties of these fruits cultivated for edible purposes only.

Canada Department of Agriculture Destructive Insect and Pest Act Advisory Board. Regulations under the Destructive Insect and Pest Act P. C. 717.—Regulation No. 14 (Foreign) 2nd Revision.—1 p., 1927.

As from 20th April, 1927, the State of Tennessee is included in the list of States from which the importation into British Columbia of peach fruit, pits, or seeds is prohibited on account of peach yellows [*R.A.M.*, v, p. 768], while the State of Arkansas is omitted.

IMPERIAL BUREAU OF MYCOLOGY

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HEMMI (T.) & YOKOGI (K.). **Pathogenicity of Piricularia oryzae on Rice seedlings.**—*Agric. & Hort.*, i, pp. 119–130, 1 pl., 1926. (Japanese). [Abs. in *Japanese Journ. of Botany*, iii, 3, pp. (47)–(48), 1927.]

The writers' experiments are stated to show that *Piricularia oryzae*, isolated from diseased rice leaves [*R.A.M.*, vi, p. 637], is capable of infecting the bases and roots of rice seedlings, though it is not a virulent root parasite. It is assumed (though no observations have yet been made on this point under natural conditions) that rice seedlings are liable to infection by *P. oryzae* if planted in seed-beds favourable for the growth of the fungus.

EDGERTON (C. W.) & TIMS (E. C.). **Investigations on the Sugar Cane disease situation in 1925 and 1926.**—*Louisiana Agric. Exper. Stat. Bull.* 197, 50 pp., 10 figs., 1 graph, 1927.

The following factors are stated to have contributed to the unsatisfactory state of the sugar-cane crops in Louisiana during 1925 and 1926; weather conditions, cultivation and drainage conditions, cane borer infestation, and diseases. Winters with heavy rainfall are usually followed by poor cane crops. The precipitation in the first three months of 1926 was the greatest on record, and the crop of that season the smallest produced for many years. Cultural conditions have apparently made the cane more susceptible to root rot. The major cane diseases, red rot [*Colletotrichum falcatum*: *R.A.M.*, iv, p. 568], mosaic, and root rot have exerted a great influence on the crop. Root rot is considered as a complex condition [ibid., vi, p. 186] due to the following causes: the presence of toxic substances in the soil, improper ratio of the mineral elements in the soil, the injury to the roots by soil animals, and attack by parasitic fungi. Root pitting due to the bites of small animals in the soil is

briefly discussed. No relation was found between the pits and rotting of the vascular tissues. Forty-eight species of fungi were isolated from the diseased roots; most of these were saprophytic, but a few, including species of *Marasmius*, *Rhizoctonia*, and *Pythium*, are usually reckoned as parasitic, at least under certain conditions. The only fungus found constantly in the roots from all localities and able to attack the vascular tissue, causing it to become soft and flabby, was a species of *Pythium*. Inoculation experiments carried out with this fungus showed that it was highly parasitic, and it seems probable that it is an important factor in the root rot problem.

The disease known in Java as 'pokkah bong' has been developing in the State during the past few years. It is characterized by a twisting and chlorosis of the new leaves of the shoot, sometimes followed by rotting of the young leaves and resulting in a shortening of the internodes. Its cause is obscure.

Investigations on control measures have included seed selection, the development of resistant varieties, seed treatment, soil treatment, and the demonstration of improved cultural practices. By seed selection strains have been obtained which are very tolerant to mosaic disease and are not seriously affected by root rot. Excellent yields have been obtained from these strains. Seed and soil treatment with formaldehyde, copper compounds, mercuric chloride, and other disinfectants were found to give rather unsatisfactory results. The use of good cultural practices has resulted in improving the yields.

LEE (H. A.). **Pathology.**—*Rept. Committee in charge of Exper. Stat. for year ending Sept. 30, 1926.—Proc. Forty-sixth Ann. Meeting Hawaiian Sugar Planters' Assoc. 1926*, pp. 34–40, 1927.

Eye spot of sugar-cane [*Helminthosporium sacchari*: *R.A.M.*, v, p. 387], formerly regarded as a minor trouble, is stated to be greatly increasing in severity and may now be regarded as the most serious fungous disease of Hawaiian canes. It has been found that the young succulent growth induced by the application of nitrogen and by over-frequent irrigation is particularly susceptible to eye spot, and these operations should therefore be suspended during the damp season, which is favourable to the development of the fungus. Deficiency of potash has been shown by pot and field experiments to be a predisposing factor in the development of eye spot, and a reduction of infection was effected by the application of potassium sulphate.

Of the more promising new seedling varieties, H. 5909, H. 8993, H. 8994, H. 8952, H. 8916, and 20 S 16 are highly resistant to eye spot. The P.O.J. varieties 36, 213, 234, and 979 are all commercially resistant, and trials are in progress with E.K. 28, which is free from eye spot in Java, and with the highly resistant seedling varieties Waialua 1 and 6. Many of the seedlings from the highly resistant Yellow Caledonia cane have proved susceptible to eye spot. Fortnightly applications of sulphur dust during the winter of 1925–6 effected a reduction of 27 per cent. in the incidence of the disease compared with the untreated controls.

Eye spot frequently develops in November, or even earlier in situations where sunlight and air circulation are excluded by hills or trees, and where the soil is very moist. Such sites act as sources of infection for a whole field, and in severe cases it may be necessary to replant these areas with resistant substitutes for H. 109, e. g., Yellow Caledonia, Badila, the Tip canes, D. 1135, and the P.O.J. varieties. Of the 1927 crop, 4·4 per cent. of the H. 109 acreage and 1·7 per cent. of the total acreage of all varieties suffered injury from eye spot—an increase of 1·1 and 0·4 per cent., respectively, over the 1926 figures. Much heavier losses may be anticipated in the near future unless steps are taken to eliminate the sources of infection.

Mosaic, red stripe [*Phytomonas rubrilineans*: ibid., v, p. 133], and iliau [*Gnomonia iliau*] were of very slight importance in Hawaii in 1926.

WOOD (E. J. F.) **Bureau of Sugar Experiment Stations. Assistant Pathologist's Report.**—*Queensland Agric. Journ.*, xxvii, 4, pp. 273–275, 1927.

In the Nambour district of Queensland, sugar-cane mosaic has been present for at least twenty years, while in Beenleigh district infection was observed on 26 out of 81 farms recently inspected. From 60 to 100 per cent. of the Green Baruma (N.G. 48) variety was affected. A distinction is drawn between the terms 'resistance' and 'tolerance' as applied to mosaic disease. Q. 813 is highly resistant, but the few infected stools make scarcely any growth and are a total loss. On the other hand, the susceptible but tolerant N.G. 48 grows almost to a normal height, though the canes are cankered, withered, and thin. Both in these districts and in the Pialba area, where mosaic is also present, the cultivation of susceptible varieties, such as N.G. 48, Shahjahanpur 10, D. 1135, and M. 1900 Seedling should be discontinued [cf. *R.A.M.*, vi, p. 375]. Roguing and other cultural measures, together with the substitution of a resistant variety, e. g., Q. 813, for the above-mentioned susceptible ones, should suffice to control this very serious disease.

Gumming disease [*Bacterium vascularum*] remains the outstanding problem in the Nambour district, where the susceptible D. 1135 is widely grown. Q. 813, H. 227, or Q. 1098 should be tried as substitutes. H.Q. 285 (Early Maturer) is moderately susceptible to gumming disease and also to *Melanconium sacchari*. In the Maryborough district, Fiji disease [*Northiella sacchari*] seems to have been present for six to ten years and has spread to twenty farms. The susceptible M. 1900 should be replaced by the Q. 813 and H.Q. 285 varieties, and strict attention should be paid to roguing and seed selection.

BLUMER (S.). **Ueber den Einfluss äusserer Faktoren auf die Entwicklung der Mehltaupilze. (Autorreferat.)** [On the influence of external factors on the development of the mildews. (Author's abstract.)]—*Mitt. Naturforsch. Gesellsch. Bern, 1926*, pp. xxvii–xxviii, 1927.

The writer carried out a number of experiments in the summer of 1926 to ascertain the effect of atmospheric humidity on the

development of the Erysiphaceae. Different species of *Lappa* were inoculated with *Erysiphe cichoracearum* in three different atmospheres with a relative humidity of 80 to 90, 60 to 70, and 40 to 50 per cent., respectively. High relative humidity was found to favour initial infection, the incubation period being one to two days shorter than in the drier atmosphere. The formation of perithecia, however, occurred only under dry conditions. These data confirm the general experience that the perfect stage of the Erysiphaceae is seldom found in damp, tropical climates.

KHARBUSH (S.). **Évolution nucléaire du Sclerotinia fuckeliana de Bary.** [Nuclear development of *Sclerotinia fuckeliana* de Bary.]—*Bull. Soc. Bot. de France*, lxxiv, Sér. 5, iii, 3–4, pp. 257–262, 1 pl., 1927.

In the author's account of the cytology of the apothecia, asci, and ascospores of *Sclerotinia fuckeliana* obtained from fallen branches of the vine, he incidentally states that the sclerotia which gave rise to apothecia when sown in damp sand also bore tufts of conidiophores of *Botrytis cinerea*.

In artificial cultures, certain sclerotia gave sterile apothecia of *Sclerotinia*, others conidiophores of *B. cinerea*.

Finally, he states that if an ascospore of *S. fuckeliana* is allowed to germinate in a nutritive medium such as grape juice, it may produce a primary mycelium which develops directly and without any intermediate stages into a conidiophore of *Botrytis*. As a rule, however, this primary mycelium produces sclerotia, and it is from these that the apothecia or the conidiophores arise.

GADD (C. H.). **Some diseases of the Tea bush.**—*Trop. Agriculturist*, lxviii, 4, pp. 213–219, 1927.

In this paper, read at the 2nd Agricultural Conference at Peradeniya, Ceylon, the author discusses plant disease in general terms illustrated by examples from diseases of the tea bush. Under the heading of highly infectious organic diseases he cites *Poria hypolateritia* as a typical example of a root parasite capable of attacking healthy tea bushes under all sorts of conditions. The method of control by trenching, as well as the extreme improbability of devising a successful means of soil treatment by chemicals are discussed. Another example of this class is the disease caused by *Cercosporella theae*. This fungus, being air-borne and attacking aerial parts, is much more difficult to control. Amongst slightly infectious diseases, or those which are dependent on some derangement of the physiological processes of the bush, are mentioned *Diplodia* root disease (*Botryodiplodia theobromae*) and *Rhizoctonia bataticola*. A discussion follows on the relationship of pruning methods with the incidence of such diseases, and the apparent inability of the tea bush to form a gum barrier below the cut surface, such as is produced in certain other plants [*R.A.M.*, vi, p. 556]. In connexion with physiological diseases the lack of knowledge concerning types of these found in the tea bush is mentioned.

The writer strongly advocates a thorough study of the physiology of the tea bush, in the hope of obtaining a fuller knowledge of the effect of the various operations performed during its cultivation; as well as a better knowledge of its diseases, both parasitic and physiological, and their control.

MOORE (ENID S.). **D'Hérelle's bacteriophage in relation to plant parasites.**—Abs. in *South African Journ. of Sci.*, xxiii, p. 306, 1926. [Received August, 1927.]

Following d'Hérelle's method, the author has shown that, in the case of *Bacterium tabaci*, an invisible agent exists in the juice of diseased tobacco leaves; this agent is repressive to the growth of the bacteria in culture. The inhibitory factor, which affects only living wildfire bacteria in saline or bouillon suspension, and is specific in action, is transmissible, and increases at the expense of the bacteria it destroys. It was found to retain its activity after heating and storage. It was also obtained from a mixture of soil and decaying diseased tobacco leaves.

BOOCK (K.). **Tomatensorten und ihre verschiedene Widerstandsfähigkeit gegen Krankheiten.** [Tomato varieties and their different capacity of resistance to diseases.]—*Gartenwelt*, xxxi, 15, p. 221, 1927.

In 1925 the writer cultivated 600 tomato plants (200 each of the Schöne von Lothringen, Tuckswood (Favourite), and Lucullus varieties) on moderately heavy clay soil in Thuringia. The first-named was heavily attacked by leaf mould [*Cladosporium fulvum*] and other fungous diseases, including late blight (*Phytophthora infestans*), and by the end of August 75 per cent. of the crop was destroyed. Tuckswood was much less severely affected and Lucullus scarcely suffered at all. Brief notes are given on the characteristics of these varieties.

DAY (W. R.). **The prohibition of the importation of Elms and the new disease.**—*Quart. Journ. of Forestry*, xxi, 2, pp. 123–129, 1927.

Since the importation of elm trees into Britain has been prohibited [*R.A.M.*, vi, p. 384], in order to exclude the disease which has been ravaging elms in the western Continental countries since about 1918, the writer summarizes briefly the known facts concerning the latter. The countries affected, the symptoms, losses, and the suggested causes are all dealt with. Of the latter, which include physiological conditions as well as parasitic organisms, the most recent work claims that the soil-inhabiting bacterium *Micrococcus ulmi* is the causal organism, and that infection occurs through wounds on roots, stems, or branches [ibid., vi, p. 385]. The writer recommends that elms, or in fact any broad-leaved tree, showing symptoms of the disease in this country should be carefully examined and promptly reported to the proper quarters for expert advice. The only possible method of control would appear to be to fell and burn affected trees.

FISCHER (E.). **Mykologische Beiträge. 34. Weitere Beobachtungen über Sclerotinia rhododendri.** [Mycological contributions. 34. Further observations on *Sclerotinia rhododendri*.] —*Mitt. Naturforsch. Gesellsch. Bern, 1926*, pp. 114–118, 1927.

Continuing his researches on the alternate hosts of *Sclerotinia rhododendri* [*R.A.M.*, v, p. 6], the writer found this fungus on *Vaccinium uliginosum*, inoculation experiments giving positive results on *Rhododendron hirsutum*. *S. heteroica* and *S. megalospora* also occur on *V. uliginosum*, while *S. baccarum* is found on *V. myrtillus*.

HOTSON (J. W.). **A new species of Exobasidium.**—*Phytopath.*, xvii, 4, pp. 207–216, 1 pl., 2 figs., 1927.

The author describes a new species of *Exobasidium*, *E. parvifolii*, which occurs on the main stems or young branches of *Vaccinium parvifolium* and less frequently on *V. ovalifolium* in Washington and Oregon. Field inoculations showed that the fungus is a wound parasite, but very slight wounds, such as leaf scars, are sufficient to allow infection. It possesses a perennial intercellular mycelium and causes the host to become hypertrophied, with the result that large galls are formed. These, from April to June, are covered with long, fungus-permeated, corniform appendages, varying in colour from pink to pale green. The anatomical differences between the normal host branches and these appendages are described, as well as the cylindrical, often curved basidiospores, 11 to 20 by 2·5 to 4 μ in diameter, and small, acicular conidia 5·5 by 1·5 μ, both of which are borne on the surface of the appendages. The conidia arise singly at the tips of lateral branches intermingled with the basidia, and inoculation experiments with them were unsuccessful. Attempts to grow the fungus in artificial culture failed, but it was found possible to infect artificially the two above-named hosts directly from the spore-bearing appendages. Inoculations of *V. ovatum* and *V. uliginosum* were unsuccessful. Formal descriptions of the new fungus are given in English and Latin.

ENGLISH (E. F.). **The preservative treatment of wood, with special reference to absorption.**—*South African Journ. of Sci.*, xxiii, pp. 472–477, 2 graphs, 1926. [Received August, 1927.]

This paper describes experiments carried out to devise a new method of employing the open-tank process of preserving timber. Dispensing with what the writer calls the 'cooling' or 'cold' treatment, this method, designated by the author 'all hot', aims at reducing the overall time of treatment.

Fence posts [*R.A.M.*, iv, p. 579], 6 ft. 6 in. long, and of about 4½ in. average diameter, were employed, the wood used being *Eucalyptus polyanthemos* and *E. maideni*. Bundles of posts were immersed in a 2½ per cent. solution of arsenite of soda at 190° to 200° F. At intervals, one or more of the bundles were removed and the posts weighed separately, sample posts being set aside for penetration tests. Immediately after weighing, the bundles were

re-immersed in the solution. The depth of penetration was determined by a visual method depending on the precipitation of yellow arsenic sulphide from acid solution. The section of the post was moistened with a dilute solution of hydrochloric acid, and a current of hydrogen sulphide directed on all parts. Tests were made at one foot from either end, and in the middle of the post.

The results are given in tabular and graphic form. They show that in the case of fence posts of high density, such as *E. polyanthemos*, treated with 2½ per cent. arsenite of soda, an all hot treatment up to a duration of 19 hours, when maximum absorption is established, does not give satisfactory absorption or penetration. On fence posts of lower density, such as *E. maideni*, a minimum length of treatment of 12 hours is required to give a satisfactory absorption of the solution.

LEATHER (G. F. T.). **Cost of creosoting under pressure.**—*Quart. Journ. of Forestry*, xxi, 2, pp. 159–161, 1927.

This article describes a method of determining the average cost of creosoting under pressure for the preservation of timber. The amount of creosote used for each charge into the storage tank should be noted by means of an accurate gauge. After two or three years the average unit per charge can be easily determined. The average amount of absorption per cubic foot can be calculated by dividing the average unit per charge by the volume in cubic feet of the tank, but allowance must be made for the unused spaces in the pressure tank. The writer found that with his plant the average charge was 225 gallons. The volume of the tank was 820 cubic feet, so that, allowing for spaces, the creosote used per cubic foot averaged one-third of a gallon. With creosote at 10*d.* per gallon, the cost works out at 3·3*d.* per cubic foot of timber treated. The writer is of the opinion that the present trade price of 10*d.* per cubic foot is not excessive, when the initial outlay and overhead expenses are taken into account, as well as the enormous saving obtained by the use of wood thus preserved.

SCHWALBE (C. G.). **Die Konservierung des Holzes im Walde.** [Wood preservation in the forest.]—*Forstarch.*, iii, 7, pp. 113–115, 1927.

The author states that a simple apparatus has been devised in Germany which enables tree trunks up to 12 m. long to be impregnated with antiseptic liquids under a pressure of 2 to 4 atmospheres in 20 to 30 hours. Chemical tests showed that, using a 1 per cent. solution of sodium fluoride, the lignified cell walls of the trunks treated by this process adsorbed 1·4 per cent. of the chemical (calculated on the weight of dry wood), thus indicating a further action than a simple displacement of the sap in the cells. The process is easy of application in the forest, and is believed to be likely to play an important part in cases when timber, intended for use as railway sleepers, mine props, telegraph posts, and the like, has to be stored for a considerable time *in situ*, awaiting favourable market conditions for its removal.

VERHOEVEN (W. B. L.). **Aantasting van Suikerbieten en Mangelwortels door Phoma betae Frank.** [Infection of Sugar Beets and Mangolds by *Phoma betae* Frank.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen* 47, 26 pp., 3 pl., 1 diag., 1927.

The symptoms of root rot of beets (*Phoma betae*) in Holland are stated to vary considerably according to the age of affected plants. Seedlings turn black and collapse soon after emergence from the soil, the root being frequently reduced to a black thread. Older plants develop light brown, often concentric, ill-defined spots, measuring 1 to 2 cm., during July to September. The pycnidia arising from these lesions are usually referred to *Phyllosticta betae*, which is, however, almost certainly identical with *Phoma betae*. Possibly a connexion exists between this stage and the development of the so-called 'galloping heart rot' on the young leaves and crown in the latter part of the summer. The youngest leaves turn black and die and the crown of the beet decays, the pycnidia of the fungus developing on the brown, sunken spots on the affected organs, including the petioles. The association of this form of the disease with excessive alkalinity of the soil and dry weather [*R.A.M.*, iv, p. 521] has also been observed in Holland. On the seed-bearers the symptoms of infection occur late in the season in the form of brown spots and stripes on the main and lateral stalks. Pycnidia develop on these lesions and also on the seed-clusters, and thus the transmission of the disease is effected. The fungus may also survive in the hyphal stage in the enveloping tissue of the clusters. Infection of the seed-bearers is stated to be very heavy almost every year, more than half the clusters being frequently attacked. The average annual loss in Holland from root rot of beets may be estimated at 40 per cent.

Since 1923 a series of experiments has been in progress in the control of root rot by seed disinfection [see also next abstract]. In one set of field trials the seed was immersed in 0·5 per cent. germisan or uspulun for two hours; in 0·25 per cent. copper sulphate solution at 42° C. for three hours; and in 2 per cent. copper sulphate for sixteen hours. The warm copper sulphate solution gave 100 per cent. of healthy plants, germisan 85, uspulun 60, 2 per cent. copper sulphate 62, and the control 26. In another experiment, with the addition of a test of four hours' immersion in uspulun and germisan, respectively, the following percentages of healthy plants were obtained: warm copper sulphate 100; four and two hours germisan 93 and 92, respectively; four and two hours uspulun 82 and 71; 2 per cent. copper sulphate 66; controls 32. The cost of treatment with 0·5 per cent. germisan is 8 cents per kg. of seed.

A special installation [which is described and figured] was erected for the disinfection of the seed by the warm solution of copper sulphate process. The solution is heated by steam and pumped into reservoirs at the required temperature. After disinfection the seed is drained and dried in a cylinder by hot air. The cost of the treatment, which was extremely successful, is estimated at about 9·5 cents [nearly twopence] per kg. of seed. The entire drying process takes seven to eight hours. During a continuous period of 24 hours 2,100 to 2,300 kg. of seed can be treated. In some cases

the number of healthy plants was more than doubled by disinfection in warm copper sulphate followed by drying, and in every instance a substantial improvement was effected. The great advantages of co-operation in the matter of seed treatment are briefly outlined, and it is stated that a number of Dutch sugar factories are preparing to adopt similar methods. Direct treatment against the 'galloping heart rot' of older plants is not practicable.

Brief notes are given on various pathological conditions of the beetroot which are liable to confusion with infection by *P. betae*. These include the damping-off caused by *Pythium de Baryanum* and *Aphanomyces levis*; a constriction of the roots, due to an unknown cause, at or near soil-level; and the attacks of the pigmy mangel beetle (*Atomaria linearis*) and of eelworms (*Tylenchus devastatrix*).

GRAM (E.). **Afsvampning af Roefrø.** [Disinfection of Beet seed.] —*Ugeskr. for Landmænd*, lxxii, 14, pp. 211–212, 1927.

The bulk of the information in this paper on the control of root rot of beets [associated in Denmark with *Phoma betae*, *Pythium de Baryanum*, and other fungi] has already been noticed [*R.A.M.*, vi, p. 72]. Of interest is the statement that satisfactory results have been obtained with tutan dust at the rate of 8 gm. per kg. of seed.

A recent experiment at Ringsted indicates that seed transmission is not an important factor in the development of brown bacteriosis of turnips and other Cruciferae [*Pseudomonas campestris*]. The incidence of this disease and of the so-called American root rot (*Phoma lingam*) was only slightly reduced by seed treatment with corrosive sublimate.

STEHLÍK (V.) & NEUWIRTH (F.). **Soll man den Rübensamen stimulieren und gegen Wurzelbrand beizen?** [Should Beet seed be stimulated and disinfected against root rot?]—*Zeitschr. für Zuckerind. (Prague)*, li, 38, pp. 435–449, 1927.

A fairly lengthy account is given of the work of earlier and contemporary investigators on the stimulation of beet seed and the control of root rot (attributed to *Phoma betae* and various soil organisms) [see preceding abstracts] by the treatment of the seed clusters with different fungicidal preparations. The writers' own experiments on the same lines in Czecho-Slovakia (extending over a number of years) are also fully described. Tests were carried out with sulphuric acid, betanal, germisan, and various stimulants, all of which gave most disappointing results both as regards increase of yield and sugar content and control of root rot. The discontinuation of all further experiments in this direction is strongly urged, the writers being convinced that no benefit can be derived from this form of treatment.

NEVODOVSKY (G. S.). Сферопсидальные грибки на клубочках семян Сахарной Свеклы. [Sphaeropsidaceae on the seed-clusters of Sugar Beet.]—*Науч. Записки Гос. Экспер. Инст. Сахарной Промышл.* [*Sugar Industry Exper. Inst. Scient. Notes*], iv, 10, pp. 315–322, 1 pl., 1927.

Since 1923 the crops of sugar beet in the Ukraine are stated to

have suffered heavily every year from seedling root rot, and extensive investigations on the disease were started in 1924 by the Sugar Industry Experimental Institution in Kieff. A thorough examination of samples representative of roughly 1,500 tons of seed showed the presence on the seed-clusters, besides *Phoma betae*, of two other fungi belonging to the Sphaeropsidaceae and differing from *P. betae* in morphological and cultural characters [a description of which is given]. Of these two organisms one, referred to the genus *Ascochytella*, is considered to be the most dangerous to the seedlings, since, under laboratory conditions, it developed readily on living beet leaves, although it was able to infect the latter only when their surface was slightly injured as by scorching with a red-hot platinum needle. It was also found that the organism from these leaves infected the leaves and twigs of *Chenopodium album* growing in the immediate neighbourhood, thus indicating the possibility of the latter being a source of the disease in the field. The other organism, which is termed by the author *Diplodina B* [a Latin diagnosis being given] and is stated to have been wrongly identified by Shevtchenko [*R.A.M.*, v, p. 273] as *Ascochyta betae*, is considered to be a saprophyte, since in the laboratory it developed only in those portions of the leaves which had been killed by scorching. Experimental evidence was obtained that *P. betae* is only a weak parasite, incapable of attacking healthy, uninjured roots of beet.

TOGASHI (K.). **On the three species of Fusarium which cause the wilt disease of Pea. (Preliminary report.)**—*Journ. Soc. Agric. & Forest., Sapporo*, xviii, pp. 149–154, 1926. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 3, p. (71), 1927.]

Monospore isolations were made from wilted pea plants of three different forms of *Fusarium*, a preliminary account of the morphological characters and pathogenicity of which is given. The average length of the non- to eight-septate conidia of form A was $49{\cdot}80 \pm 0{\cdot}35\ \mu$. The conidia of form C were often recurved at both ends, measured on an average $71{\cdot}00 \pm 0{\cdot}57\ \mu$, and had the same number of septa as form A. The non- to five-septate conidia of form B measured only $35{\cdot}67 \pm 0{\cdot}65\ \mu$. The highest degree of pathogenicity (40 to 75 per cent. infection) was shown by form A (the strains of which do not vary conspicuously in this respect), while forms B and C showed 17 and 20·4 per cent., respectively.

SHARP (C. G.). **Virulence, serological, and other physiological studies of Bacterium flaccumfaciens, Bact. phaseoli, and Bact. phaseoli sojense.**—*Bot. Gaz.*, lxxxiii, 2, pp. 113–144, 1 pl., 7 figs., 1 graph, 1927.

This is a further account of the author's studies on various physiological aspects of *Bacterium flaccumfaciens*, *Bact. phaseoli*, and *Bact. phaseoli sojense* [*R.A.M.*, vi, pp. 458, 459].

Of the two strains, Nos. 7 and 8, isolated from a pure culture of *Bact. flaccumfaciens* and characterized by differences in the type of colony produced, the former was much less pathogenic to beans than the latter, but both had the same physiological and serological reactions. The two strains (Nos. 1 and 2) of *Bact. phaseoli* differed

a little in virulence and cultural characters but were indistinguishable serologically.

LINK (G. K. K.) & SHARP (C. G.). **Correlation of host and serological specificity of Bacterium campestre, Bact. flaccumfaciens, Bact. phaseoli, and Bact. phaseoli sojense.**—*Bot. Gaz.*, lxxxiiii, 2, pp. 145–160, 1927.

This is a more extensive account of the writers' investigations on the correlation of host and serological specificity in *Bacterium campestre* [*Pseudomonas campestris*], *Bact. flaccumfaciens*, *Bact. phaseoli*, and *Bact. phaseoli sojense* than that already noticed [*R.A.M.*, vi, p. 458]. It was shown by agglutination tests [which are described and the results presented in tabular form] that the biological specificity displayed by these organisms in their host relations is associated with immunological or serological specificity.

FLACHS. **Wurzelhalsfäule an Salatpflänzchen.** [Collar rot of Lettuce plants.]—*Obst- und Gemüsebau*, lxxiii, 7, pp. 103–104, 3 figs., 1927.

Collar rot of lettuce, characterized by the presence on the root collar of sunken, reddish-brown lesions, sometimes penetrating to the vascular bundles, was found to be due to *Rhizoctonia violacea* [*Corticium solani* is evidently intended] in March, 1926, near Munich, where the plants were excessively watered and insufficiently ventilated. The fungus attacks chiefly older plants (differing in this respect from the causal organism of drop [*Sclerotinia sclerotiorum*]) and infection spreads in concentric zones. Richards and Hemmi have shown that the optimum temperature for infection by *R. violacea* is 18° C. The fungus was found to be present on 88 per cent. of the seed tested in a series of germination experiments. Good control of the disease was given by half an hour's immersion in 0·25 per cent. germisan or 0·5 per cent. uspulun. Agfa (0·25 per cent.) caused some injury to the seedlings. Soil disinfection with hot water, 0·5 per cent. formalin, or 0·5 per cent. carbolic acid (5 l. per sq. m.) is also recommended and the plants should receive a plentiful supply of potash as well as nitrogen.

HARTLEY (C.). **Pale dwarf disease of Peanut (Arachis hypogaea).**—*Phytopath.*, xvii, 4, pp. 217–225, 1 pl., 3 graphs, 1927.

In this paper a new disease of young plants of the groundnut (*Arachis hypogaea*) is described under the name of 'pale dwarf' to distinguish it from another form of dwarfing, known as 'club leaf' dwarfing, in which the chlorophyll content is higher than the normal. Pale dwarf is characterized by a pale colour and marked reduction of the leaflets, and, in extreme cases, reduction of the petioles. Roots, hypocotyl, and stipules are not dwarfed. In severe cases death may occur, but usually the plants recover, and mature only a little later than the normal time. As a result of the early set-back, the yield is reduced. The disease is generally distributed throughout West Java, but is infrequent, and of little economic importance. It has also appeared in seedlings grown in Java from seed brought from West Africa.

The incidence of dwarfing is consistently higher in the progeny

of some seed lots than in others. This is shown to be partly due to the inverse correlation between germinative vigour and dwarfing tendency, but in part probably also to hereditary tendencies. The disease is believed to be non-parasitic in origin; observations on the environmental physical conditions during germination have provided evidence that it is due to excessive heat of the surface soil after sowing. It is suggested that this may destroy or inactivate some substance essential for the normal growth of the leaflets.

NOZIMA (T.). **On a disease of Soybean pods due to the parasitism of a Fusarium fungus.**—*Journ. Plant Protection*, xiii, 10 pp., 1 pl., 1926. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 3, p. (65), 1927.]

A species of *Fusarium* with white to rose-coloured hyphae produced numerous minute, salmon-pink spots on soy-bean pods, thereby arresting the growth of the seeds. Infection occurs chiefly through wounds. The fungus grows well on various nutrient media, but made very poor development on a water extract of maize meal and on agar containing this extract. It is probably unable to infect soy-bean roots.

VIALA (P.). **Le dosage des bouillies cupriques contre le mildiou.** [Dosage of copper sprays for the control of mildew.]—*Rev. de Vitic.*, lxvi, 1710, pp. 213–216, 1927.

The author protests vigorously against the recommendation to use, from a mistaken sense of economy, weak concentrations of copper sulphate in liquid sprays for the control of mildew of the vine [*Plasmopara viticola*]. He cites numerous experiments and observations of practical growers, in which the application of proprietary brands of Bordeaux and Burgundy mixtures with as low contents of copper sulphate as 0·5 to 1 per cent. led to calamitous outbreaks of the disease with a consequent almost total loss of the harvest. In his opinion the lowest permissible percentage of copper sulphate is 2, and where conditions are particularly favourable for the development of mildew, 3 per cent. solutions should be used. So far as he is aware copper sulphate is the only efficient specific against the disease, as experiments with numerous other preparations have given poor or negative results. The efficacy of a preparation against late blight of the potato [*Phytophthora infestans*] is not a criterion of its efficacy against vine mildew, which he considers to be the more virulent of the two fungi.

LABERGERIE. **Sur la virulence du Phytophthora.** [On the virulence of *Phytophthora*.]—*Rev. de Vitic.*, lxvi, 1712, pp. 254–255, 1927.

With reference to Viala's paper [see last abstract] in which a comparison is made between the virulence of the vine mildew [*Plasmopara viticola*] and that of potato late blight (*Phytophthora infestans*), the present author stresses the biological differences between the two fungi, and the more saprophytic nature of the latter. He finds support for this view in the distinctly putrid odour emanating from potato fields infected with late blight, an

odour which is never present in mildewed vineyards. He also points out that in France the usual experience is that in years when the vine mildew is most severe, potato blight is comparatively slight, and vice versa, the latest example being in 1925, when even untreated vines were almost immune from mildew, while potato fields in the immediate neighbourhood were severely blighted.

RAVAZ (L.). **Chronique: Notes sur le mildiou.** [Current events: Notes on mildew.]—*Prog. Agric. et Vitic.*, lxxxvii, 18, pp. 429–436, 1927.

This article gives a succinct account of the symptoms, causes, and manner of infection of vine mildew [*Plasmopara viticola*]. Sulphate of copper, neutral or normal acetate of copper, and basic acetate of copper, in solution, are said generally to prove less satisfactory in its control than the copper mixtures, Bordeaux and Burgundy.

Acid Bordeaux mixture has proved no more effective than neutral or alkaline mixtures, and is, moreover, unsuited to damp regions, where it causes scorching. For tender foliage, mixtures approaching neutrality are recommended. Bordeaux mixture, if slightly alkaline, is suitable for most vines, but if too alkaline should not be used on vines sensitive to dissolved copper.

The scorching occasioned by the use of Burgundy mixture in damp, northern regions can be obviated by substituting bicarbonate for carbonate of soda, or mixing the two in the proportion of 3 parts carbonate of soda to 1 part bicarbonate of soda [*R.A.M.*, iv, p. 587]. For use in warm regions, Burgundy mixture should be made very alkaline by adding an excess of carbonate of soda.

Copper dusts are recommended, especially to supplement liquid treatments that fail to reach the fruit clusters. If used alone, they should be applied after each shower.

A copious first treatment for vine mildew must be given when the fruit clusters emerge from the surrounding leaves. Subsequent treatments may be made either as groups of 4, 5, or 6 new leaves form, or the first attack of mildew may be awaited before a second treatment is given, followed by treatments as soon as possible after every shower. Towards flowering time, liquid treatments should be followed by dust applications, attention being particularly directed to the fruit clusters. When growth has ceased, a final treatment with Bordeaux or Burgundy mixture should be applied to the entire vine, to prevent premature loss of foliage.

DEGRULLY (L.). **Chronique: Le traitement du mildiou et la formule Villedieu.** [Current events: The treatment of mildew and the Villedieu formula.]—*Prog. Agric. et Vitic.*, lxxxvii, 15, pp. 357–359, 1927.

According to Villedieu, the results obtained with his formula [0·5 kg. copper sulphate, 2·5 kg. hydrated calcium sulphate dust (mesh No. 200), 2·5 kg. quicklime, and 100 l. water, stated to have given satisfactory results in the control of vine mildew [*Plasmopara viticola*] in a large number of field tests in 1926], indicate

that a great economy in the use of copper sulphate in vine sprays may be made.

The author considers it advisable, however, to warn vine growers against adopting this method in place of the old formula without further tests. Experiments in Algeria recorded by Vivet (*Rev. Agric. de l'Afrique du Nord*, 11th March, 1927) indicate that Villedieu's mixtures gave less satisfactory control of vine mildew than 2 per cent. alkaline Bordeaux mixture.

DEGRULLY (L.). **Chronique : Le traitement du mildiou et la formule Villedieu.** [Current events: Control of mildew and the Villedieu formula.]—*Prog. Agric. et Vitic.*, lxxxvii, 17, pp. 405–408, 1927.

The method of treating vine mildew [*Plasmopara viticola*] hitherto most widely practised in France, consists in spraying with mixtures containing 2 per cent. copper sulphate, but Villedieu claims that better results follow the application of a mixture of his invention [see last abstract]. What results follow treatment with this mixture have not yet been fully ascertained, but vine growers who wish to test it can only obtain the powdered calcium sulphate (which is prepared in a special manner) through Messrs. Schloesing Frères at Marseilles on the order of Villedieu. They are reminded that in such tests control plants must be left without treatment.

FONZES-DIACON (J.). **Le mildiou. Que peut-il sortir des nouvelles expériences de M. Villedieu ?** [Mildew. What results from the new experiments of M. Villedieu ?]—*Prog. Agric. et Vitic.*, lxxxvii, 19, pp. 456–458, 1927.

This article pointedly questions the importance which Villedieu in his recent experiments [*R.A.M.*, iv, p. 297 ; v, p. 375 ; and last abstracts] has attached to calcium sulphate as a fungicide. In the author's opinion the experiments only serve to show that copper is still the best known remedy for vine mildew.

CADORET (A.). **Contribution à l'étude des traitements contre le mildiou. Détermination des époques d'attaques du champignon.** [Contribution to the study of the treatments for mildew. Determination of the active periods of the fungus.] *Prog. Agric. et Vitic.*, lxxxvii, 15, pp. 362–365, 1927.

The protective action of such Bordeaux mixtures as, by reason of their high copper sulphate and lime content, impart a blue tint to the vines has already been clearly demonstrated in the control of mildew [*Plasmopara viticola*] in France [*R.A.M.*, iii, p. 187 ; iv, p. 715]. In the present paper, the author reiterates his arguments in favour of this type of mixture. However, the necessity of anticipating the active periods of the fungus by correlating these with meteorological conditions so as to be able to apply the treatment at the proper time is emphasized. A series of observations made in Savoy and Ardèche and covering a period of twenty-five years [a summary of which is given in tabulated form] has led to the following conclusions.

The fungus is apparently inactive in cold and rainy years with few storms (e.g. 1911 to 1913, and 1920 to 1925). In 1914 and

1923 the number of rainy days during the critical period for mildew is given as 10 to 14, stormy days as 3 to 7, and temperature in May, June, and July as 19° to 35° C. No damage from the disease was reported during those years. Even when the rainfall is abundant, but the temperature still low (as in 1924, with 18 to 22 wet days recorded and a temperature of 18° to 28° during May and June), mildew was scarcely evident. The really severe attacks which had a serious effect on the yield, as in 1900, 1910, and 1915, coincided with heavy rainfall (40 to 45 days), high temperature from 10th June to 15th July, and frequent storms (20 to 28 days).

These observations enable the dates of spraying in Savoy and above the line from Bordeaux to Briançon to be indicated, and they can be adapted for regions farther south without difficulty. The directions given correspond with those previously noticed [loc. cit.].

V. (V.). **Le court-noué sur les hybrides franco-américains.** [Court-noué on Franco-American hybrids.]—*Rev. de Vitic.*, lxvi, 1713, p. 274, 1927.

Although so far only French grafted vines were believed in France to be susceptible to court-noué, a number of Franco-American hybrids (Seibel No. 4643 and No. 4964) from five to seven years old in a small vineyard on the banks of the Saône were found during the past two or three years to suffer from the trouble, which rapidly kills them. The cultivation and fertilization in the affected vineyard are stated to be good. This is believed to be the first record of court-noué on hybrids of *Vitis vinifera* and American species.

Preston (N. C.). **Part I. Report of the Advisory Mycologist. April, 1926–March, 1927.**—*Rept. Advisory Dept. Harper Adams Agric. Coll., Newport, Salop*, ii, pp. 2–6, 1927.

The results are given of tests made with thirteen different substances applied to healthy cabbage seedlings, before setting them in heavily infected soil, for the control of club root [*Plasmodiophora brassicae*]. A dilute solution of corrosive sublimate, about 1 oz. in 6 galls. of water, applied at the rate of about half a pint to each plant, gave the most satisfactory results, viz., 1 per cent. very badly clubbed and 72 per cent. moderately clubbed. Uspulun gave 37 and 63 per cent., respectively, and the control 84 and 11 per cent. The cost of using the sublimate is estimated at about sevenpence per hundred plants, and attention is drawn to the necessity for finding a substance suitable for use on a farm scale.

Brief notes are also given on the principal diseases of economic plants observed in the West Midlands of England during the year.

Krankheiten und Beschädigungen der Kulturpflanzen im Januar bis März 1927. [Diseases and pests of cultivated plants in the period from January to March, 1927.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 5, pp. 46–51, 1927.

This is the first of a series of reports that, in pursuance of a decision reached at the general meeting of the German Plant Protection Service in January, 1927, will be henceforth published at monthly intervals, and will record the most important diseases and

pests of cultivated plants noticed throughout Germany during the preceding month. The present issue does not contain anything deserving special notice.

[Sharples (A.).] **Annual Report of the Mycologist for 1926.**—*Malayan Agric. Journ.*, xv, 5, pp. 152–159, 1927.

Inoculations made by the author have led him to conclude that the *Diplodia* [*Botryodiplodia theobromae*] associated with diseases of rubber trees, such as die-back, lightning-strike, sun-scorch of exposed roots, and the like, is a specialized form of wound parasite, capable of making, under suitable conditions, rapid headway in the woody tissue of *Hevea brasiliensis*. On many hilly estates in Malaya die-back is serious. Of 105 branches of *H. brasiliensis* affected, 11 showed typical *Diplodia*, 22 showed *Diplodia* with other fungi or insects, and in the remainder no *Diplodia* was found.

Besides the type of patch canker already reported from Malaya [? *Pythium sp.*: *R.A.M.*, v, p. 325], that due to *Phytophthora faberi* has also been recently found. *Ustulina zonata*, which finds easy access into the stem of trees through broken branches, is stated to be responsible for heavy losses on many coastal estates. A bad attack of the root disease caused by *Fomes lignosus* occurred on young rubber trees, in which the main source of infection proved to be old stumps of kempas (*Koompassia malaccaensis*) riddled with mycelium.

The author states that the symptoms of the coco-nut disease known as lightning-strike can be found apart from lignification of the stem tissues [ibid., v, p. 79], so that, probably, two diseases are concerned. Sections of diseased stems were found to yield practically pure cultures of *Polyporus ostreiformis*.

A species of *Marasmius*, as yet unidentified [loc. cit.], recently damaged some two-year-old coco-nut palms. The bases of the affected trees rot to a black, fibrous mass, after which the palms die.

Fungi attacked the roots of gutta taban trees (*Palaquium oblongifolium*); on one specimen, the external, white, mycelial strands of *F. lignosus* were seen, while the more serious disease on the older trees was a wet root rot, closely resembling in appearance that caused by *F. pseudoferreus*. Pink disease (*Corticium salmonicolor*) was also identified on branches of gutta taban trees.

Annual Report of the Jamaica Department of Agriculture for the year ended 31st December, 1926.—29 pp., 1927.

In section V of this report, dealing with plant diseases and pests (pp. 15–17), C. C. Gowdey states that the total number of cases of Panama disease of bananas [*Fusarium cubense*] treated during 1926 was 21,151 compared with 14,199 in 1925. In a note contributed by H. H. Cousins on banana breeding experiments, it is reported that the Giant Fig variety from Grenada has been found to be identical with the Robusta. The Bumelan from Dutch Guiana also appears to be of the Robusta type. Strong evidence has been obtained in two cases of the natural production of the Robusta variety by accidental crossing of the China [*Musa cavendishii*] with the Jamaica Gros Michel banana [*M. sapientum*].

Four hundred good seeds of various crosses, chiefly with *M. kewensis* as one of the parents, have been obtained and some of the older seedlings raised in 1925 will probably fruit shortly. One seedling of a cross between the immune Robusta and the common Gros Michel is also growing.

REICHERT (F.). **Immunisierungsversuch mit überlebendem Organbrei gegen die bacillogenen Tumoren von Blumenthal.** [An experiment in immunization against Blumenthal's bacterial tumours with an emulsion of living organs.]—*Zeitschr. für Krebsforsch.*, xxv, 1, pp. 62–63, 1927.

In continuation of his previous experiments [*R.A.M.*, vi, p. 342], the writer carried out two further tests in the immunization of rats against Blumenthal's bacterial [*Bacterium tumefaciens*] tumours. The animals received six to seven subcutaneous injections of 0·5 c.c. of an emulsion prepared from the liver, spleen, and muscles of freshly killed guinea-pigs. Four to six weeks later a highly virulent tumour emulsion was subcutaneously injected into the surviving rats. Immunization was successful in 84·2 per cent. of the cases in the first test, and in 74 per cent. in the second.

DADE (H. A.). **Economic significance of Cacao pod diseases and factors determining their incidence and control.**—*Gold Coast Dept. of Agric. Bull.* 6, iii + 59 pp., 1 fig., 1 map, 14 graphs, 1 diag., 3 charts, 1927.

This report describes a number of very detailed investigations carried out to obtain precise information on the conditions, especially in regard to pod diseases, obtaining in the native cultivation of cacao in the Gold Coast.

The Anyinam district of Abuakwa was selected as the site where the observations were to be made, because of the high incidence of pod disease in this area. A temporary laboratory was installed, and the area remained continuously under observation from May until December, 1926.

In most farms close planting has resulted in excessive humidity and insufficient ventilation. Shade is adequate until gaps are made by trees dying of root disease or mechanical injury, when the resulting exposure of the soil seriously affects the neighbouring trees.

The variety of cacao most successfully cultivated in the Gold Coast is yellow Amelonado, originally imported from San Thomé and Fernando Po. The main crop is harvested between September and December, and a small mid-season crop was formerly taken between May and June but is now negligible. The author states that there is probably some relation between the periodicity of fruiting and seasonal rain.

The most important disease of cacao in the Gold Coast is 'black pod', due to *Phytophthora faberi*, the incidence of which in the total crop was 40·5 per cent. out of the 55·4 per cent. of pod rot found in the author's experimental plots, six of which, each one-fifth acre in extent, were selected in different parts of the district. In each of these the trees were labelled and each pod within reach, as it was set, was also labelled and kept under observation.

Meteorological data were recorded throughout the period of observation. The severity of infection was found to depend mainly upon atmospheric humidity, which is undoubtedly the key factor in the incidence of the disease. In a farm in which the incidence of diseased pods amounted to about 40 per cent. of the total trunk crop in 1926, the following sources of infection were determined. Contact with diseased pods caused about 10 per cent. infection of the total trunk crop and dripping of water containing zoospores or sporangia from diseased pods about 4·5 per cent., leaving 25·5 per cent. due to other factors. The incidence of infection on different parts of the pod in this last group indicated that it is related to the morphology of the host, probably in part concerned with the setting up of local concentrations of moisture on the pod. Where a pod touches another or the trunk, moisture is likely to accumulate and infection becomes possible. At the base of the pod (where 17 per cent. of the infections in this group occurred) this factor is complicated by infection from diseased cushions. Infection at the tip of the pod is probably due to the presence of water drops at the drip point. It is evident that these factors, depending as they do on the morphology of the pod and its relations to surrounding parts, should be taken into account in attempting to find varieties of cacao less subject to pod rot, and they were found to be remarkably constant in their action. The diseased cushions are thought to play an important part in carrying over infection from one season to another.

Insects are probably the chief agents in the transportation of spores from one tree to another. Insects removed from trees were allowed to walk over the surface of the medium in sterile culture tubes, with the result that cultures of *P. faberi* were obtained, mixed with saprophytes. Man also plays a part in transmission.

In farms where the conditions governing the water-relations of the host are well balanced, injury to pods through insects and other agents is unimportant, though it was found slightly to increase the incidence of black pod in certain cases. No evidence was obtained from careful investigations that accumulations of empty husks are of importance in the overwintering or spread of this disease, their influence being insignificant as compared with the presence of diseased pods on the trees. Examination of husk-heaps showed the presence of *Thielaviopsis paradoxa* on the mucilaginous tissue, where it was producing micro- and macro-conidia, and very luxuriant *Stysanus*-like bodies. *T. paradoxa* is not known to infect cacao, but its presence in great quantities on husks is stated to be not without potential significance to other crops.

The author suggests, as the most suitable preventive measures for black pod, the reduction of humidity to a minimum, and the control of the growth of the trees to eliminate to some extent morphological characters favourable to infection. He considers that the disease could be almost entirely eliminated if this control was supplemented by the introduction of a strain of Amelonado characterized by a slightly modified morphology.

A larger proportion of pod disease of cacao (6·2 per cent.) than previously supposed, was found to be due to the anthracnose caused by a species of *Colletotrichum* (? *C. cradwickii*), but the disease is

not of economic importance. The strain of *Botryodiplodia theobromae* found in the Gold Coast is either less virulent than that found elsewhere, or else the host in the Gold Coast is more resistant, since it was only responsible for 0·3 per cent. of the pod infections. *Trachysphaera fructigena* [*R.A.M.*, ii, p. 495] caused only 0·1 per cent. of the pod diseases found and the fungus is evidently only a weak parasite on cacao since it is universally present as a saprophyte in the farms.

DADE (H. A.). **'Collar crack' of Cacao (Armillaria mellea [Vahl] Fr.).**—*Gold Coast Dept. of Agric. Bull.* 5, 21 pp., 17 pl., 3 figs., 1927.

Collar crack, attributed by the author to the tropical African variety (distinguished from those commonly found in temperate regions by its smaller size and deeper colour) of *Armillaria mellea*, causes extensive damage in the cacao-growing area of the Gold Coast Colony and Togoland, attacking numerous other woody and herbaceous plants [a list of which is given] besides cacao. The disease produces characteristic fissures in the collar of the tree [*R.A.M.*, ii, p. 210], from which the sporophores [described by the author in detail] arise in clusters, near the ground. The xylostroma protrusions, which emerge as frills from the radial cracks in the trunk, are, like rhizomorphs, free from contact with the walls between which the sheets of xylostroma are compressed. When freshly extruded the frills are cream-coloured and fleshy, but they turn black and become brittle with age. Sheets of xylostroma are scarcely ever found between the bark and the wood in the Gold Coast, though this is their usual position in temperate countries. A hyper-parasite, thought to be a species of *Hypomyces*, has been found on these structures. Rhizomorphs, though not found in the field, were readily produced in the laboratory, both in cultures in tubes, and also when infected roots were placed in wet moss.

The author states that, in the Gold Coast, *A. mellea* is undoubtedly a very virulent parasite, attacking trees of all ages that show no signs whatever of other damage. Infection begins in the lateral roots, and extends into the main axis, where plates of xylostroma, originating in the medullary rays which are early invaded, rupture the wood, with the consequent production of radial fissures. The attack is usually unilateral, and suckers may be thrown up on the side farthest from infection, but eventually these are also killed. Cases of recovery are practically unknown. The wet rot of the tap root that frequently follows infection is thought to be possibly due to secondary bacterial invasion.

The absence of rhizomorphs, the agency of which is usually considered necessary for the infection of new individuals by *A. mellea*, is assumed by the author to be due to the character of the soil, which, in the areas concerned, is a very stiff clay. In all the cases examined, infection was found to be due to actual contact of the host's roots with other diseased roots, or rotting wood. Humidity appears to be the only environmental condition associated with intensity of infection, and control usually consists in reducing this, together with destroying morbid material and isolating the areas

affected by means of trenches. As *A. mellea* has many wild hosts, a close watch must be kept on trees surrounding the cacao farms, and on the shade trees in them. The saprophytic habit of the fungus enhances the difficulty of eradicating it from farms surrounded by bush.

Legislation has been instituted in the Gold Coast and Togoland to ensure effective control [see below, p. 703]. The prescribed treatment consists in the removal and immediate destruction by burning of all diseased material, and in the isolation of the affected area by trenches two feet deep.

L. (E.). **La production du Cacao à l'Équateur.** [The production of Cacao in Ecuador.]—*Agron. Colon.*, xvi, 113, pp. 173–174, 1927.

According to a statement in the *Bol. Dep. Agric. Ecuador*, 1, November, 1926, the production of cacao in Ecuador has been so greatly reduced by the attacks of *Marasmius perniciosus* [*R.A.M.*, v, p. 349] that the cultivation of this crop may have to be abandoned. The yield has sunk from 900,000 quintals [nearly 1,800,000 cwt.] during 1914 to 1917 to 350,000 quintals in 1926. The Venezuelan variety 'cojon de toro' is said not to suffer from this disease, but scientific experiments will be necessary to test its resistance under the conditions prevailing in Ecuador.

Mains (E. B.). **Studies in rust resistance.**—*Journ. of Heredity*, xvii, 9, pp. 313–325, 6 pl., 1 diag., 1926. [Received 1927.]

In this paper the author discusses in general terms some of the outstanding aspects of rust resistance in cereals, illustrated by examples from *Puccinia triticina* on wheat, *P. anomala* [*P. simplex*] on barley, *P. sorghi* [*P. maydis*] on maize, *P. dispersa* on rye, and various other rusts.

Köck (G.). **Das Wesen der Gelbrostbekämpfung des Weizens.** [The nature of the control of yellow rust of Wheat.]—*Fortschr. der Landw.*, ii, 10, pp. 319–321, 1927.

Hege's theory as to the factors predisposing to the infection of wheat by yellow rust [*Puccinia glumarum*: *R.A.M.*, vi, p. 346] is summarized and discussed. In the writer's opinion, the direct influence of external conditions on the incidence of infection is over-rated. Such factors become significant only when they deviate so far from the norm as to cause serious metabolic disturbances in the plant. Inherent characters are of far greater importance than environmental conditions in reaction to rust.

Tingey (D. C.). **Smut studies preliminary to Wheat breeding for resistance to bunt.**—*Journ. Amer. Soc. Agron.*, xix, 7, pp. 655–660, 1927.

Bunt (*Tilletia tritici*) is stated to cause heavy annual losses in the wheat crop of the Rocky Mountain States, 30 per cent. of the crop in northern Utah and southern Idaho being affected in 1925. Tests of varietal resistance carried out at the Utah Experiment Station, under dry farm conditions, in the season 1925–6 showed that none of the common winter varieties nor various new hybrids

and selections suitable for the region were resistant, though Odessa was not seriously attacked. On the other hand, the varieties Hussar, Martin, Ridit, White Odessa, and Hybrid 128 × White Odessa from the U.S. Department of Agriculture and Washington State proved highly resistant, though they are otherwise of no commercial value in Utah. Artificially contaminated seed-grain treated with copper carbonate gave in most cases very satisfactory results, an infection of 82·3 per cent. in the controls being reduced to an average of 1·6 per cent.

Similar tests with spring wheat in 1926 showed that most of the 224 strains tested are susceptible to bunt. Only eight strains showed no infection, and these require further testing. The two Washington strains Golden Ball (Wash. 1944) and a Turkey-Marquis cross (Wash. Wn. 326/576) were apparently as resistant in Utah as in Washington. Copper carbonate was very effective in controlling the disease in spring wheat, reducing infection from 21·3 to 0·01 per cent.

MULLETT (H. A.). **Wheat pickling methods.**—*Journ. Dept. Agric. Victoria*, xxv, 5, pp. 290–293, 1927.

Brief popular notes are given on the chief methods of wheat seed-grain disinfection against bunt [*Tilletia tritici* and *T. levis*] practised in Victoria. These are three minutes' immersion in copper sulphate (1¼ lb. to 10 galls. of water) or formalin (1 lb. to 45 galls.), or dusting with a copper powder at the rate of 2 oz. per bushel. The last-named method is less effective than the liquid treatments in cases of severe contamination [*R.A.M.*, vi, p. 543].

KIESSELBACH (T. A.). **Field experiments with seed Corn treatments and crop stimulants.**—*Nebraska Agric. Exper. Stat. Bull.* 218, 15 pp., 2 figs., 1927.

The results of three years' experiments [which are summarized and presented in tabular form] showed that the seed treatment of maize, winter wheat, oats, and barley was not beneficial except in the case of infection by the covered smuts of oats and barley [*Ustilago levis* and *U. hordei*] and wheat bunt [*Tilletia levis*]. The incidence of the last-named disease on the Kanred variety was reduced from 42 to 1, 4, and 1·6 per cent. by formalin, copper carbonate dust, and 0·25 per cent. uspulun, respectively. Used as crop stimulants, uspulun, semesan, and Bayer dust (the two last-named applied at the rate of 2 oz. per bushel) did not materially increase the yield from healthy seed-grain, and no significant effect was produced by the treatment on ordinary seed maize as regards germination, vigour, percentage of smut [*U. zeae*], lodging, yield, and other factors. Infection by *Diplodia zeae* and *Gibberella saubinetii*, which has been found to be amenable to seed treatment [*R.A.M.*, vi, p. 159], is stated to be of minor importance in Nebraska maize crops.

NEILL (J. C.). **Covered smut of Barley and its control.**—*New Zealand Journ. of Agric.*, xxxiv, 5, pp. 304–308, 1 fig., 1927.

Covered smut of barley [*Ustilago hordei*] is stated to be one of the commonest and most destructive diseases of barley in New

Zealand. The author carried out a large number of experiments on the control of this disease during 1926, the results of which are given in tabular form in this paper. Copper carbonate and semesan dusts (2 oz. per bush.), semesan and uspulun steeps (0·25 per cent. for 1 hr.), and Clarke's wheat protector failed to disinfect completely. Copper sulphate (1 and 2 per cent.) controlled covered smut in the Cape and Odger's Plumage varieties, but failed to do so in Beck's Plumage ; germination was seriously lowered by the 2 per cent. solution with the latter variety only. Formalin, 1 to 240, 1 to 320, and 1 to 480, gave complete disinfection with the exception of one plant of Beck's Plumage. Germination and total heads produced were higher in all three than in the untreated controls. The hot water method, i. e., presoaking for six hours at 60° and 80° F., followed by a dip of five minutes at 121° to 129° F., presoaking at 60° followed by a dip of 10 minutes at 119° to 127° F., and a dip without presoak of 10 minutes at 125 to 133° F., gave complete disinfection except for one plant with Cape and Odger's Plumage, but certain seeds of Beck's Plumage seemed particularly resistant to disinfection. No advantage was apparent in using a presoak temperature of 80° rather than 60° F., and no material drop was apparent in the germination or in the number of heads produced.

EVERSMANN (Miss G. A. A.) & ABERSON (J. H.). **Weitere Untersuchungen über die Dörrfleckenkrankheit.** [Further investigations on grey speck disease.]—*Landw. Jahrb.*, lxv, 5, pp. 649–673, 7 figs., 1927.

From 1923 to 1927 the writers carried out a series of investigations on the grey speck disease of oats and barley [*R.A.M.*, vi, p. 29] at the Wageningen (Holland) Agricultural College. In order to ascertain whether bacteria play a part in the causation of the disease, comparative experiments were conducted with plants grown in sterilized and non-sterilized pots. The plants grown under absolutely sterile conditions showed no trace of grey speck from 1923 to 1926 inclusive, and the yield of both crops was higher in the sterilized pots than in those receiving the largest applications of manganese sulphate, though these were also effectual.

It was found that the quantity of oxidases in the roots was increased by the application of manganese. This effect was most pronounced during the early stages of growth. It was further shown that the amount of nitrite in the roots was decreased by the application of manganese, and that the occurrence of grey speck generally coincides with the presence of the nitrite ion in the roots, and (in severe cases) also in the leaves. These effects were observed both in the diseased soil of the Oosterbeek experimental field and in sand cultures.

Quantitative determinations of the ash of plants from sterilized and unsterilized soils showed a uniformly higher manganese content in the former than in the latter case. The leaf ash from sterilized pots yielded up to ten times as much manganese as that from unsterilized. The favourable influence of sterilization may be attributed, at any rate in part, to this increased assimilation of manganese and consequent augmented oxidation of NO_2'. No

direct correlation was found between the quantity of manganese applied to the soil and that found in the leaves. The roots of plants from sterilized pots did not show such a marked increase in manganese content as the leaves, but a more direct connexion was traced between the amounts applied and those taken up.

FROHBERG (A.). **Zur Bekämpfung der Fusariumkrankheit beim Sommergetreide.** [On the control of the *Fusarium* disease in summer cereals.]—*Illus. Landw. Zeit.*, xlvii, 18, pp. 234–235, 2 figs., 1927.

Serious damage to winter and summer cereals in Germany was caused during the heavy rains of July and August, 1926, by the attacks of the snow mould (*Fusarium nivale* or *F. minimum*) [*Calonectria graminicola*]. Contrary to the popular belief, the writer's observations indicate that summer cereals suffer quite as severely from *Fusarium* infection as the winter crops. The incidence of the disease in the rye crops examined ranged from 60 to 70 per cent. The best control of *C. graminicola* on rye, wheat, oats, and barley in the writer's tests was given by 15 minutes' immersion in 0·5 per cent. germisan.

ZIMMERMANN (F.). **Zur Bekämpfung der Fusariose des Roggens mit Trockenbeizmitteln.** [On the control of the fusariosis of Rye with dusts.]—*Zeitschr. für Pflanzenkrankh. und Pflanzenschutz*, xxxvii, 5–6, pp. 163–172, 1927.

In the region of Czecho-Slovakia bordering on the German frontier, the *Fusarium* disease of rye [*Calonectria graminicola*] causes excessively heavy damage, and the problem of its control, as well as that of oat smut [*Ustilago avenae*] and stripe disease of barley [*Helminthosporium gramineum*], is of great importance. Excellent results in the control of the snow mould were obtained with abavit B, oderberg T (Oderberger Chemische Werke, Neu-Oderberg), and tillantin dusts, and with liquid uspulun, the percentage of germination being increased and the average weight of the seedling raised by about 15 per cent. Merck dust was unsatisfactory.

KORFF & BÖNING [K.]. **Bericht über das Auftreten von Krankheiten und Schädlingen an landwirtschaftlichen Kulturpflanzen im 1. Vierteljahr 1927.** [Report on the occurrence of diseases and pests of cultivated agricultural plants during the first quarter of 1927.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 2, pp. 47–51, 1927.

Winter injury to the rye crops caused by *Fusarium* [*Calonectria graminicola*] in different parts of Bavaria was so extensive (covering approximately one-third of the total area) that many fields had to be ploughed up. This damage could have been largely avoided by timely disinfection of the seed-grain.

FLACHS. **Aplanobacter rathayi E.F.S. an Roggen.** [*Aplanobacter rathayi* E.F.S. on Rye.]—*Illus. Landw. Zeit.*, xlvii, 20, p. 262, 1 fig., 1927.

In May, 1926, a rye crop near Staffelstein [Bavaria] was found to be attacked by *Aplanobacter rathayi*, which caused a malforma-

tion of the ears. These were mostly 'deaf' and adhered to the uppermost leaf sheath, from which they protruded in a curve similar to that observed in plants damaged by hail. The bacteria occurring in the viscous, yellow mucilage on the affected ears corresponded in all respects with the causal organism of bacteriosis of *Dactylis glomerata* [*R.A.M.*, i, p. 370] as originally described by Rathay. Infection is supposed to take place through immediate contact with diseased plants, especially during rainy weather.

TISDALE (W. H.), MELCHERS (L. E.), & CLEMMER (H. J.). **Strains of kernel smuts of Sorghum, Sphacelotheca sorghi and S. cruenta.**—*Journ. Agric. Res.*, xxxiv, 9, pp. 825–838, 4 pl., 1927.

Experiments were carried out at Arlington Experimental Farm, Virginia, and in Texas and Kansas, in 1925 and 1926, to compare the morphology and pathogenicity of the smut from the Milo and Hegari varieties of sorghum [*R.A.M.*, v, p. 485], with the ordinary covered kernel smut of sorghum (*Sphacelotheca sorghi*) and if possible to determine the identity of the former. Extensive inoculation experiments [full details of which are given] of numerous varieties and hybrids of sorghum with both fungi proved that the smut on Milo and Hegari differs from *S. sorghi* in being pathogenic to Milo, White Yolo, and Hegari, hitherto resistant strains. It is also pathogenic to those sorghums that are susceptible to the ordinary covered smut.

Externally the smut on Milo and Hegari closely resembles *S. sorghi*, although it occasionally possesses some of the characteristics of loose smut of sorghum (*S. cruenta*). In almost every specimen microscopic examination showed two types of sterile membrane cells: elongated, narrow cells occurring in chains, typical of the sterile cells of *S. sorghi*, and broadly spherical cells grouped in balls, typical of *S. cruenta*. The significance of these intermediate characters is discussed, and the conclusion reached that probably the smut of Milo and Hegari is a strain of *S. sorghi*, but modified as a result of response to different physiological conditions. Other possibilities are that the former is a hybrid between *S. sorghi* and *S. cruenta* resulting from a fusion between hyphae of the two species growing on the same host plant; or that the Milo smut may be an intermediate in a series of variants ranging from *S. sorghi* as one extreme to *S. cruenta* as the other.

A collection of kernel smut of Feterita sorghum made in 1921 is regarded as a strain of *S. sorghi* differing in its pathogenicity from the ordinary covered kernel smut, and also from the strain on Milo and Hegari.

S. cruenta was found in secondary heads of Feterita C. I. 182 in Texas in 1926. This variety of sorghum has hitherto been free from loose kernel smut [see next abstract].

MARTIN (J. H.) & RATLIFFE (G. T.). **Loose kernel smut on Feterita.**—*Phytopath.*, xvii, 5, pp. 338–339, 1927.

On 28th September, 1926, a second crop of Feterita sorghum (C. I. No. 182) at the U.S. Field Station, San Antonio, Texas, was found to be infected by loose kernel smut (*Sphacelotheca cruenta*)

to the extent of 10 per cent. The fungus had apparently entered the plants in the seedling stage, but on account of retarded development it failed to reach the heads of the first crop. Thus the apparent immunity of Feterita from loose kernel smut [*R.A.M.*, iii, p. 85 *et passim*] may be merely a case of escape due to the arrested growth of the causal organism within the host.

TINDALE (G. B.). **Valencia late Oranges. Cool storage experiments.**—*Journ. Dept. Agric. Victoria*, xxv, 5, pp. 276–279, 1 fig., 1927.

An experiment was recently carried out to ascertain the effect of three months' storage on Valencia late oranges, 3,500 cases of which were required for use by the Victorian railway refreshment services. After careful picking, the fruit was sweated and forwarded to the Government Cool Stores, Melbourne, where twelve cases were stored in the experimental chambers on 16th December, 1926, three at each of the following temperatures: 34°, 36°, and 40° F., while the rest were placed in the ordinary cool store. Until the end of February the fruit kept very well under the latter conditions, the total loss being estimated at under 5 per cent. After this date, however, blue mould [*Penicillium italicum*] developed extensively, spreading to the fruit from the inside of the cases. Browning or scald was also observed, the symptoms not being confined to the button end as in similar experiments with Washington Navels [*R.A.M.*, vi, p. 480]. At the end of April the oranges stored in the experimental chambers, where the spacing was wider than in the cool store, were in excellent condition, the loss in weight ranging from ¾ lb. at 34° to 4¾ lb. at 40°, while the incidence of blue mould was negligible and no superficial blemishes were detected.

TUCKER (C. M.). **Sabal causiarum (Cook) Beccari: a new host of the Coconut bud-rot fungus.**—*Journ. Agric. Res.*, xxxiv, 9, pp. 879–888, 4 figs., 1927.

A bud rot of sabal (*Sabal causiarum*), the leaves of which are used in the manufacture of hats and baskets, was discovered in Porto Rico in 1926. The symptoms, which are described, are indistinguishable from those of coco-nut bud rot (*Phytophthora palmivora*) [*R.A.M.*, v, p. 488], which also appeared in Porto Rico in the same year, the two diseases being found in close and constant association. A species of *Phytophthora* was isolated from sabal, and found to be indistinguishable morphologically and culturally from *P. palmivora*. Inoculation experiments showed that both the coco-nut and sabal strains were slightly pathogenic to wounded eggplant [*Solanum melongena*] fruits, distinctly pathogenic to wounded papaw (*Carica papaya*) seedlings, and non-pathogenic to cacao, roselle [*Hibiscus sabdariffa*], *Erythrina poeppigiana*, breadfruit [*Artocarpus incisa*], and eggplant seedlings. Inoculations with each strain on unwounded coco-nut palms resulted in both producing typical bud rot, so that *Sabal causiarum* must be regarded as an additional host of *P. palmivora* and should be included in any campaign undertaken for the eradication of

bud rot. The coco-nut strain used was first isolated in 1924 and showed some slight loss of virulence after two years' culture.

TRAVERS DRAPES (E. H. A.). **Spraying of Coffee.**—*Planters' Chron.*, xxii, 19, p. 292, 1927.

The writer quotes the figures at which he has recently purchased the necessary materials for spraying coffee plantations [against *Corticium koleroga* and other diseases] in South India [*R.A.M.*, iv, p. 591; vi, p. 78]. The cost of a mixture of 4 lb. copper sulphate, 4 lb. lime, 2 lb. resin, 1 lb. soda, and 50 galls. water may be estimated at a total of Rs. 13–6–6 [approximately £1 0*s.* 0*d.*] for 500 galls. Calculating transport at Rs. 1–2 and cost of application at Rs. 5–7–6 per acre [about 9*s.* 11*d.* together], the total cost of treating 1,000 large bushes, in an even field of old coffee, at the rate of 500 galls. per acre, is about Rs. 20 [£1 10*s.* 0*d.*].

BRITON-JONES (H. R.). **Mycological notes. I.**—*Trop. Agriculture*, iv, 5, p. 88, 1927.

Several varieties of cotton grown at the Research Station of the Cotton Corporation in Trinidad have recently been found to suffer from two root-rotting diseases not previously recorded in the West Indies. One of these is caused by *Rhizoctonia bataticola* [*R.A.M.*, vi, p. 629] which is responsible for a wilt of cotton in India and Egypt [ibid., v, p. 20], while the second, generally known as violet root rot (*R. crocorum*), is not believed to have been previously recorded on this host. Field observations have shown that the Dharwar American, Nanking, and Sea Island A. N. varieties are susceptible to both diseases; the Broach Type IA 9 (*Gossypium herbaceum*) is susceptible to *R. crocorum*; and Cawnpore (*G. arboreum*), Million Dollar, Buri from Nagpur, and Upland Cassava to *R. bataticola*. In a field experiment the incidence of both diseases was decreased by the application of pen manure before sowing.

MONTPELLIER (J.) & CATANEI (A.). **Sur une glossite observée à Alger. Étude du champignon présent au niveau des lésions.** [On a case of glossitis observed at Algiers. Study of the fungus present on the surface of the lesions.]—*Comptes rendus Soc. de Biol.*, xcvi, 16, pp. 1278–1280, 1927.

For five years a European resident of Algiers has suffered from chronic glossitis with intermittent crises. Ordinarily the anterior portion of the tongue is covered with whitish, slightly raised, smooth lesions measuring 5 mm. to 1 cm. in diameter, but during the acute periods the tongue swells and bleeds.

An examination of the pellicle covering the lesions revealed the presence of numerous branched, septate hyphae of variable length and 3 to 5 μ in width, together with some oval cells, 4 to 6 μ in diameter. Cultures on Sabouraud's medium and other solid substrata at 37° yielded a profuse, creamy-white growth. On liquid media a whitish deposit was formed. Gelatine was not liquefied nor serum coagulated. Glucose, levulose, galactose, dextrin, maltose, and saccharose were fermented, with production of gas in the

first four. Milk was rendered alkaline, but not coagulated, in about a fortnight.

This fungus, which is stated to be evidently a *Monilia* [*Candida*], differs in morphological characters from *M.* [*C.*] *albicans* and closely resembles the form recently isolated by the writers from two other cases involving the buccal cavity [*R.A.M.*, v, p. 738].

BROCQ-ROUSSEU, URBAIN (A.), & BAROTTE (J.). **Étude des teignes du cheval et de l'immunité dans les teignes expérimentales.** [Study of equine ringworms and of immunity in experimental ringworms.]—*Ann. Inst. Pasteur*, xli, 5, pp. 513–553, 2 figs., 1927.

In this paper the writers give a complete summary, under the following headings, of their researches (extending from October, 1925 to December, 1926) on equine ringworms. 1. Systematic determination of the parasites associated with equine ringworms. 2. Experimental inoculations. 3. Immunity in experimental ringworms. 4. Antibodies in experimental ringworms. 5. Allergic reactions to trichophytine—their specificity—relations with tuberculine. 6. Vaccination experiments with trichophytine. 7. Cutaneous electivity of animal ringworms [*R.A.M.*, vi, p. 484].

OGILVIE (L.). **Aster yellows in Bermuda. A disease of many cultivated plants.**—*Agric. Bull. Dept. Agric. Bermuda*, vi, 5, pp. 7–8, 1927.

In January, 1927, several cases of yellows of aster [*Callistephus chinensis*: *R.A.M.*, vi, p. 297] were detected by the author in Bermuda where the leafhopper *Cicadula sexnotata*, responsible for the transmission of the disease, has been known to occur since 1924. The affected plants were stunted, with vivid yellow leaves and shoots and abnormal green flowers; they presented a bushy appearance due to the over-production of lateral shoots. The disease also occurs on cos lettuce, affected plants of which have unusually pale, stiff leaves with raised blisters between the veins, and develop an excessive number of lateral shoots. Cabbage lettuces frequently show a red discoloration of the leaves, and both types fail to 'heart'.

Other plants liable to contract yellows are chrysanthemums, *Centaurea*, *Gypsophila elegans*, *Arctotis grandis*, *Calendula officinalis*, annual scabious [*Scabiosa*], and *Phlox drummondi*. Several wild plants are affected, especially the sow-thistle (*Sonchus oleraceus*).

PAPE (H.). **Einige wichtige Feinde der Edelnelken und ihre Bekämpfung.** [Some formidable enemies of Carnations and their control.]—*Gartenwelt*, xxxi, 19, pp. 288–289; 21, pp. 319–320, 6 figs., 1927.

Serious damage is frequently caused to carnations [*Dianthus*] in Germany by *Heterosporium echinulatum*, the symptoms produced by which are described. The disease occurs both in the open and under glass, spreading with great rapidity, particularly on pot plants during the winter. It is favoured by damp, stagnant air

and close planting. The Grenadier, Victoria, and Chabaud varieties from original French seed have been found highly susceptible to *H. echinulatum*.

In addition to the usual sanitary measures, the author recommends the disinfection of frames, tools, and the like with solutions of 0·1 to 0·2 per cent. formaldehyde, 2 per cent. copper sulphate, or 0·5 per cent. uspulun; soil sterilization by steam or with 1 per cent. formaldehyde; and repeated applications of 1 to 2 per cent. Bordeaux mixture during the growing period.

VAN BEYMA THOE KINGMA (F. H.). **Die Botrytis-Krankheit der Päonien.** [The *Botrytis* disease of Peonies.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten', Baarn (Holland)*, xi, pp. 60–66, 4 figs., 1927.

Previous literature on *Botrytis paeoniae* contains a number of discrepancies which have given rise to much confusion in the recognition and classification of this species [*R.A.M.*, vi, p. 510]. In specimens received from Aalsmeer in May, 1927, and investigated by the writer, the size and shape of the conidia were variable. Those of the elongated-oval type measured 16 to 18 by 7 to 7·5 μ in agreement with Oudemans's original description, while the ovate to oval ones were shorter and broader. The average dimensions of 200 spores were 13·93 by 8·42 μ. Numerous small sclerotia were formed on the stems of young plants and a dense layer of these bodies also developed in culture. The ampullae described by Oudemans are believed to be identical with the swellings at the bases of the conidiophores observed in the writer's cultures. The 'spicules' in the diagnosis of Oudemans are thought to be short, rhizoid-like or jagged outgrowths (to which conidia frequently adhere in culture) at the proximal, not the distal end of the conidiophore.

From Klebahn's description (*Weitere Untersuchungen über die Sclerotien-Krankheiten der Zwiebelpflanzen*, p. 46, 1907) it would appear that the *Botrytis* found by him on lilies of the valley (*Convallaria majalis*) is also identical with *P. paeoniae*.

A revised diagnosis based on the present investigations is given in German.

PEGLION (V.) & SACCHETTI (M.). **Intorno alla peronospora del Lillà (Phytophthora syringae Klebahn).** [On the downy mildew of Lilac (*Phytophthora syringae* Klebahn).]—*Rendic. Accad. Lincei*, Ser. 6, v, 9, pp. 696–698, 1927.

The authors state that *Phytophthora syringae* was first observed on lilac in Italy in July, 1926 [*R.A.M.*, vi, p. 396]. Investigations since made on cultivated lilacs near Bologna revealed, with the approach of autumn, numerous lesions resembling those due to frost injury, but which, on microscopic examination, showed the mycelium, sporangia, and oospores of *P. syringae*. The symptoms and course of the disease are described [ibid., iv, p. 36].

Experiments have led the writers to conclude that the dissemination of *P. syringae* is mainly by means of water. They have obtained no evidence that the disease was introduced by the importation of affected plants from Holland.

BRITTLEBANK (C. C.) & FISH (S.). **A garden fungus disease. A wilt of Tomatoes, Iceland Poppies, and other garden plants in Victoria caused by the fungus Phytophthora cryptogea (Pethy and Lafferty).**—*Journ. Dept. Agric. Victoria*, xxv, 6, pp. 380–381, 1927.

In 1909 cinerarias in a glasshouse near Melbourne became affected by a wilt disease due to *Phytophthora cryptogea*, which has since spread to tomatoes and a number of flowering plants. Tomato plants up to 5 inches in height are attacked in the seed-beds and develop the typical symptoms of damping-off. Iceland poppies [*Papaver nudicaule*] are generally infected when the buds are about 2 inches from the ground, and such plants usually fail to reach the flowering stage. The foliage turns yellow and the stem base shows a dark discoloration. Similar symptoms develop on cinerarias, lupins, wallflowers [*Cheiranthus cheiri*], asters [*Callistephus chinensis*], and antirrhinums at flowering time. Infection spreads mainly from the discoloured portions of the diseased stems. The fungus, which can kill young tomato plants within five days and cinerarias within eight, is known to persist in the soil for several years. The application of lime to the soil appears to intensify its action. Good control of the disease under Victorian conditions has been obtained by the use of the Cheshunt compound [*R.A.M.*, i, p. 373] and by steam sterilization of the soil.

WEIMER (J. L.). **A wilt disease of Alfalfa caused by Fusarium sp.**—*Phytopath.*, xvii, 5, pp. 337–338, 1927.

In September, 1926, lucerne plants about six months old at West Point, Mississippi, were found to be attacked by a wilt disease resembling that caused by *Aplanobacter insidiosum* [*R.A.M.*, vi, p. 164]. The affected plants were somewhat dwarfed and in some cases were dying from the top downward. A reddish-brown discoloration of the xylem was observed, sometimes involving the entire woody cylinder and frequently extending from the root into one or more shoots for a distance of three or four inches. The disease differs from bacterial wilt in the darker coloration of the affected tissues, and the presence of the colouring matter in the cell walls as opposed to the lumina of the vessels. A species of *Fusarium* was almost constantly isolated from the diseased tissues, and inoculation experiments with this organism on plants of different ages gave a high percentage of positive results. Under greenhouse conditions the leaves turn yellow and the plants gradually become stunted and die about two months after inoculation. The xylem of artificially infected plants shows darkened areas similar to those occurring under natural conditions. The fungus under investigation is stated to be distinct from *F. roseum*, which has been reported in connexion with root rot and wilt of lucerne. Further studies on the disease are in progress.

JEHLE (R. A.) & HUNTER (H. A.). **Observations on the development of the perithecia of Venturia inaequalis (Cke) Wint. in Maryland.**—*Plant Disease Reporter*, xi, 1, pp. 2–3, 1927. [Mimeographed.]

To determine when the first apple scab [*Venturia inaequalis*]

spray should be applied, scabby leaves were collected and the development of the perithecia was studied in the spring of 1927. It was found that, although scab lesions were scarce on the leaves from orchards sprayed the previous year, the old leaves on the ground revealed abundant perithecia. The writers conclude that the fungus spreads saprophytically in the old foliage after the leaves fall. The first discharge of ascospores occurred on leaves collected in Charles and Carolina counties; these leaves reached Maryland University on 5th April. The trees in the former region were in the pre-pink, and those in the latter a little past the delayed dormant, spraying stage. In certain areas, spraying in the pre-pink stage was advised. A table shows the dates of ascospore maturity and ejection in various localities, as recorded in the Plant Disease Survey files from 1925 to 1927.

BAUNACKE [W.]. **Kleine Mitteilungen. Der Apfelmeltau.** [Brief notes. Apple mildew.]—*Die Kranke Pflanze*, iv, 5, p. 87, 1927.

Apple mildew [*Podosphaera leucotricha*] is stated to be again extending in Germany [*R.A.M.*, vi, p. 394]. It should be combated by prompt and drastic pruning; the removal of all infected material; repeated applications of sulphur spays, e.g., cosan, elosal neu, erysit, präsulphur, or solbar; and the selection of resistant varieties.

BRAUN (K.). **Ueber Kupferkalk- und Schwefelkalkbrühe.** [On Bordeaux mixture and lime-sulphur.]—Reprinted from *Die Landwirtschaft*, 21 (*Beil. zum Stader Tagebl.*), 1 p., 27th May, 1927.

Certain varieties of apples and pears have been found to be very susceptible to injury from Bordeaux mixture and lime-sulphur applied for the control of scab (*Fusicladium*) [*Venturia inaequalis* and *V. pirina*]. For Pitmaston Duchess and Andenken an den Kongress pears the concentration of the former preparation should not exceed 1·5 per cent., whereas Bürgermeister can tolerate a strength of 3 per cent. Kalvill and Gravenstein apples should be sprayed immediately after flowering with 0·5 to 1 per cent. Bordeaux mixture, followed by four or five more applications at intervals of two to three weeks. On the whole, Bordeaux mixture appears to be more efficacious than lime-sulphur in the humid climate of Stade [mouth of the Elbe]. Bosc's Flaschenbirne, Neue Poiteau, Zuckerbirne, and Pitmaston Duchess pears and Signe Tillisch and Beauty of Boskoop apples are also susceptible to injury from lime-sulphur. Nosperal and nosprasen [*R.A.M.*, vi p. 595] have been found valuable in the control of scab, the latter also being used for simultaneous destruction of insect pests.

Spray calendar for Apples and Quinces.—*New Jersey Agric. Exper. Stat. Circ.* 201, 4 pp., 2 figs., 1927.

This schedule, superseding Circular 180 of the New Jersey Agricultural Experiment Station [*R.A.M.*, v, p. 501], contains the following special recommendations. Commercial concentrated lime-sulphur (4 quarts to 50 galls. water) is advised in place of dry-mix sulphur-lime in orchards which are not subject to russeting of the fruit or burning of the foliage. Where blotch [*Phyllosticta solitaria*]

has been severe, the same mixture should be used for the third to sixth applications, inclusive, of the regular schedule (when fruit buds of Stayman, Baldwin, and Delicious show colour; directly after petal fall; and 7 and 17 days after petal fall). For the seventh and eighth applications (4 to 5 and 10 to 11 weeks after petal fall) Bordeaux mixture 2–4–50 should be used, with an accessory spray 6 to 7 weeks after petal fall. For early ripening varieties, such as Yellow Transparent, Duchess, Starr, and Red Astrachan, six applications are ordinarily sufficient.

Spray calendar for Pears.—*New Jersey Agric. Exper. Stat. Circ.* 164, 4 pp., 3 figs., 1927.

This schedule, superseding that recommended in Circular 149 of the New Jersey Experiment Station, comprises seven applications (of which two are directed solely against insects) of disinfectant sprays for the control of pear diseases: (1) directly after petals fall: New Jersey dry-mix or self-boiled lime-sulphur plus 3 lb. of lead arsenate paste or 1½ lb. of lead arsenate powder; (2) 7 days after petal fall; (3) 17 days after petal fall; (4) 4 to 5 weeks after petal fall; and (5) 10 to 11 weeks after petal fall: as above.

FLINTOFF (A.). **Pear scab (Venturia pirina).**—*Journ. Dept. Agric. Western Australia,* 2nd Ser., iv, 2, pp. 248–250, 1927.

Pear scab (*Venturia pirina*) is stated to be much more rife among orchards situated in coastal areas of New South Wales than in those in higher, inland regions; only in the latter case has treatment with commercial lime-sulphur at ordinary strength proved successful.

Experiments were carried out at Bridgetown, Western Australia, during 1926, to test the efficacy in controlling pear scab of commercial Bordeaux mixture (Schloesing's) at various strengths. An application of this mixture at a strength of 2 lb. to 10 galls. water in autumn was found quite ineffective. When this was followed by a second at the pink stage with the mixture at a strength of 2 lb. to 7 galls. water, the scab was controlled, but the spray, besides damaging the foliage, was found permanently to russet the fruit.

Experiments were then conducted with lime-sulphur 1 to 8 used once when leaf and blossom buds began to swell, and again when forward blossoms showed pink. This gave eminently satisfactory results, and is also stated to obviate the use of a separate insecticide.

The author emphasizes that spraying must be carried out at times indicated solely by bud development.

WORMALD (H.). **Canker in Fertility Pear trees.**—*Journ. Min. Agric.,* xxxiv, 2, pp. 162–165, 1 pl., 1927.

The writer, from observations made at East Malling Research Station, suggests a reason for the common failure from canker (*Nectria galligena*) of the Fertility variety of pear, especially when worked on seedling free pear stocks. Two sets of seven-year-old Fertility pear trees, both on similar series of quince and free pear stocks, one set grown as standards and the other as bush trees, are interplanted at the Station, and have received similar treatment except that the latter have had the leading branches tipped, and

the laterals spurred annually. In 1926 the standards were crippled with canker and the bush trees were practically free from it. Examination showed that wherever cankers were present there were also scab pustules (*Venturia pirina*). The latter fungus attacked first and provided a means of entry for the canker organism [*R.A.M.*, ii, p. 318]. The explanation of the difference of attack seems to be that in the bush trees those parts liable to scab attack were pruned away each year, and in the standards they were not.

The influence of the stock in predisposing the trees to infection is not yet certain, but records show that when grown as standard trees on common pear stocks, Fertility pear trees are very susceptible to canker. Since such trees made the most vigorous growth, it seems that growing this variety of pear on a stock inducing vigour makes it more susceptible. It is therefore recommended that Fertility pears should be grown as bush trees, or if standards are preferred, that a thorough and systematic spraying with Bordeaux mixture should be carried out to control the scab. The first spray should be applied just before flowering and the second immediately after the fruit is set. Later spraying is necessary if the trees have been badly infested the previous year. Spraying to control unsightly lesions on the fruit and leaves of bush trees should not be neglected. Cankers should be cut out as soon as they appear.

CARNE (W. M.). **Lithiasis and bitter pit of Pears.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 2, pp. 202–206, 4 pl., 1927.

Lithiasis of pears [*R.A.M.*, i, p. 11] is stated recently to have proved economically serious in Western Australia. The condition is characterized by small, gritty lumps in the tissues, just beneath the skin; often the skin bursts, and wart-like eruptions appear on the surface. As in South Africa, pears of the Williams variety have suffered most, but several others have been affected.

Bitter pit has also been observed in a serious form on pears of the Beurré Bosc, Winter Bartlett, and Josephine varieties. The fruit becomes distorted and shows rounded elevations and irregular depressions. The corky areas in the flesh are sometimes found as far in as the core, and are harder than those in apples owing to the presence of stone cells. The surface depressions are not discoloured as in apples, nor is there any evidence of starch deposits in association with the affected tissues. Bitter pit in pears is quite distinct from lithiasis, having larger, darker, and corky, not gritty, internal spots, and no surface eruptions. In some varieties of pear, the damage from this disease is said to equal that found in Cleopatra apples.

Spray calendar for Peaches.—*New Jersey Agric. Exper. Stat. Circ.* 202, 4 pp., 5 figs., 1927.

This schedule, superseding Circular 181, is substantially identical with that previously recommended for the control of leaf curl [*Taphrina deformans*], scab [*Cladosporium carpophilum*], and brown rot [*Sclerotinia americana*] of peaches in New Jersey [*R.A.M.*, v, p. 504].

ZELLER (S. M.). **Preliminary studies on witches' broom of Strawberry.**—*Phytopath.*, xvii, 5, pp. 329–335, 4 figs., 1927.

In the early summer of 1925, an unusual disease of strawberries, characterized by a spindly habit of growth and multiplication of leaves, was observed in Oregon. The disease, which has been termed witches' broom, is apparently of rare occurrence and may be restricted to a very low percentage by roguing. The varieties affected include Marshall, Nick Ohmer, Oregon, and Ettersburg No. 121. Diseased Marshall plants have long, erect, stiff, spindly petioles bearing abnormally small, pale to olive-green leaves, with downward arching veins, in direct contrast to the upward cupping of the leaflets affected by yellows [*R.A.M.*, v, p. 617]. The stalks of individual leaflets are often longer and the midribs broader and paler than those of healthy plants, while turgidity and crinkliness of the leaflets are also conspicuous features of witches' broom. The flower-stalks are very scarce, spindly, and unfruitful. The runners are greatly shortened, and the young plants take root abnormally near the parents and contract similar symptoms. The root systems of diseased plants appear normal and well developed.

In the variety Ettersburg No. 121 the bushy character of the disease is much more pronounced, and the internodes of the runners are so extremely short that the young plants take root immediately beside the parent crown. The leaves do not show such a pronounced downward arching as those of other varieties.

The results of transmission experiments conducted with the strawberry aphis (*Myzus fragaefolii*) in 1926 are described. Twenty-five healthy Marshall plants were enclosed in insect-proof cages, one to each cage. Four of these plants, to which aphids from healthy plants had been transferred, remained healthy; nine out of fourteen showed the witches' broom symptoms in three to four weeks after aphids which had fed on diseased Marshall plants for eight days were transferred to them, and five out of seven were similarly affected by aphids transferred to them after feeding on diseased Ettersburg No. 121 plants. The symptoms gradually became more apparent during six months' subsequent observations.

These data are regarded as conclusive proof that witches' broom of strawberries is caused by a virus transmissible by *M. fragaefolii*, and also that the two groups of symptoms described above are both expressions of the same disease.

WARDLAW (C. W.). **The Strawberry disease in Lanarkshire.**—*Ann. of Appl. Biol.*, xiv, 2, pp. 197–201, 1927.

A description of the disease affecting strawberry plants in Lanarkshire has already been given [*R.A.M.*, vi, p. 239]. Soil conditions in the districts where it is prevalent are shown by the author to be, on the whole, unfavourable especially on account of bad drainage, lack of humus, slight acidity, and insufficient ventilation. These factors are thought to contribute towards producing weakened plants, which are easily attacked by common soil organisms usually regarded as saprophytic. The isolation from the diseased roots and the pathogenicity of a species of *Pythium* have been described before [loc. cit.], but the writer considers that the problem of controlling the disease is an agricultural rather than a

ments [the results of which are summarized in tabular form] established that plants affected by mild mosaic showed no mottling at 28° C., while at the same temperature plants with red raspberry mosaic betrayed only obscure symptoms. Under field conditions in Michigan, yellow mosaic is distinct throughout the summer, this being partly due to a relatively higher temperature maximum for the expression of the symptoms. Leaf curl symptoms are marked at all temperatures at which affected plants will grow.

The symptoms of red raspberry mosaic vary widely with different varieties; inconspicuous mottling characterizes the Sunbeam variety, but severe mottling, necrosis, and stunting accompany the disease on black raspberries.

Ringing experiments indicated that the leaf curl virus moves in some part of the bark, the sieve tubes being suggested as the most natural channels. The slow movement of this virus through a plant after infection would indicate, in the author's opinion, a correlation with food translocation.

Wide varietal ranges of susceptibility, disease tolerance, and apparent immunity in relation to virus diseases are found in the raspberry group. The Cardinal variety appears either to be immune or to have the symptoms of infection masked.

The most satisfactory control measures consist in careful roguing, and in the selection and production of virus-free nursery stock [ibid., v, pp. 505, 564].

ZELLER (S. M.). **The yellow rust of Raspberry caused by Phragmidium imitans.**—*Journ. Agric. Res.*, xxxiv, 9, pp. 857–863, 2 pl., 2 figs., 1927.

The yellow rust of red raspberries caused by *Phragmidium imitans*, although fairly widespread in the northern United States, only reaches economic importance in the Pacific North-west. The fungus is autoecious and attacks several species of *Rubus*, especially *R. strigosus*, and *R. spectabilis*. Its morphology, as observed on the Cuthbert red raspberry, is described in detail. All attempts to germinate the aecidiospores failed, but a very few teleutospores, held over from the previous year, were successfully germinated, as were also a number of uredospores. The aecidial lesions on the leaves may be so dense as to cause defoliation, and berry pickers frequently have their clothing almost covered with the orange uredospores, which are formed on the leaves, petioles, fruiting laterals, and stems. The infection of the green succulent canes does not usually present a serious aspect, but by the second year the infections near the ground have become deep and cankerous and constitute the most serious phase of the disease, since the resulting lesions produce brittleness and diminish the sap-conducting tissues. These canes are easily broken in trellising, and the rise of sap may be insufficient for complete maturity of the fruit. Not infrequently the cane lesions are subsequently infected by *Fusarium viticola*.

No satisfactory means of control are as yet known, but extreme sanitary methods for the elimination of old leaf and cane refuse are thought to be the most practical. Spraying with Bordeaux mixture (3–3–50) gave rather hopeful results in 1924, but tests in

1925 and 1926 were unsatisfactory owing to the absence of infection in those years.

GUYOT (L.). **Le problème actuel des anticryptogamiques. III. Complexes à poids moléculaire élevé et produits colloïdaux.** [The present problem of fungicides. III. Compounds of high molecular weight and colloidal products.]—*Journ. d'Agric. Prat.*, xci, 21, pp. 418-420, 1927.

In continuation of his previous papers on various aspects of the fungicide question [*R.A.M.*, vi, p. 627], the writer gives simple explanations, based on biochemical and therapeutical considerations, of the principles underlying the use of compounds of high molecular weight and of colloidal products. Particulars are also given of the composition and application of some standard German preparations, namely, uspulun, germisan, fungolit, and segetan I and II.

ENGELMANN. **Ein praktischer Trockenbeizapparat.** [A practical dusting apparatus.]—*Obst- u. Gemüsebau*, lxxiii, 9, p. 142, 1927.

The writer recommends the Brillant dusting apparatus (Brose & Co., Elberfeld), which consists of a tin cylinder closed by a detachable lid. An axis passing through the centre of the cylinder is fitted with propellers which mix the seed and dust when the machine is turned. The apparatus, which is constructed to hold 1 kg. of peas or other seed, costs only M. 1·90.

LEE (H. A.) & MARTIN (J. P.). **A method for testing in vitro the toxicity of dust fungicides to fungous spores.**—*Phytopath.*, xvii, 5, pp. 315-319, 1927.

In connexion with the control of eye spot of sugar-cane (*Helminthosporium sacchari*) in Hawaii [see above, p. 642], the writers have devised the following method of testing *in vitro* the toxicity of various dusts to the spores of this fungus.

The organism is cultured in Petri dishes on standard nutrient agar plus 2 per cent. glucose, P_H 7·0. The cultures are generally kept at 25° C. in total darkness for nine or ten days, when dense masses of spores are available. About 50 or 60 cover glasses are placed in rows on the bottom of glass dusting chambers, about 20 cm. in diameter, which are then sterilized in an autoclave. One drop of a suspension of the fungus is placed on each cover glass and 2 gm. of the dust to be tested is blown into the chamber by means of a puff gun. The cover of the dusting chamber is then replaced and, after intervals of $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 3, 4, 6, 10, 12, 24, and 48 hours, five of the dusted cover glasses are removed and placed in a culture tube containing nutrient bouillon. Growth occurs in two to four days, unless the dust has been toxic to the organism. As a rule four or five dusts are tested simultaneously, with a separate chamber as a control.

The results of a test carried out in October, 1924, showed that the spores of *H. sacchari* are killed in one hour by Du Pont dust No. 12, in ten hours by Du Pont dust No. 18, and in 24 hours by Du Pont dust No. 13. Du Pont dust No. 1 did not readily destroy the spores in 46 hours, while calcium hydrate, though minimizing

germination at the end of this period, did not completely inhibit it. In another test, Du Pont No. 12 destroyed the spores in a period of 15 minutes, while Nos. 13 and 18 took four hours and one hour, respectively. Generally speaking, the results of field tests have corroborated those obtained in the laboratory.

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1926.** [Bibliography of plant protection literature published in 1926.]—*Biol. Reichsanst. für Land- und Forstwirtsch., Berlin-Dahlem,* 231 pp., 1927.

This bibliography of German and foreign literature on different aspects of plant protection follows the lines adopted in previous years [*R.A.M.*, v, p. 569].

Estimated losses through plant diseases in New Zealand.—*New Zealand Journ. of Science & Techn.*, ix, 1, pp. 44–46, 1927.

Some interesting statistics relating to the losses caused by plant diseases in New Zealand are contained in this report, presented to the Council of Scientific and Industrial Research.

The loss from bunt of wheat [*Tilletia tritici* and *T. levis*] is about 1 per cent., this low figure being due to the practice of seed treatment. However, the present methods of treatment do not give full control, and moreover they cause, through damage, an average annual loss of at least 25 per cent. of the seed. The estimated cost of these methods is £45,000.

Loose smut of wheat [*Ustilago tritici*] causes an average loss of 2 per cent., but in epidemics, as in the Marton district in 1924–5, this figure may be increased to 50 per cent. Other diseases, e.g., scab [*Gibberella saubinetii*], foot rots [*Ophiobolus graminis*, &c.], and rusts [*Puccinia* spp.], cause an annual reduction in yield of 5 to 10 per cent.

In 1925–6 the smuts of oats [*U. avenae* and *U. levis*] caused a loss of 600,000 bushels in South Island. The annual loss in oats from other fungous diseases is approximately 5 per cent.

The barley smuts [*U. nuda* and *U. hordei*] are responsible for an annual loss of 10 per cent.; other fungous diseases, 5 per cent.

Foot rot of peas [? *Fusarium* sp.: *R.A.M.*, ii, p. 432; iv, p. 581] reduced the yield in 1924–5 by 25 per cent.

The annual reduction in the potato crop as a result of late blight [*Phytophthora infestans*], early blight [*Alternaria solani*], *Corticium* disease [*C. solani*], powdery scab [*Spongospora subterranea*], and mattery eye [*Bacterium solanacearum*], is fully 50 per cent. The presence of powdery scab seriously affected sales to Australia during the past season, no tubers from infected farms being eligible for export to that country.

Dry rot and club-root of swedes and turnips [*Phoma napobrassicae* and *Plasmodiophora brassicae*] cause an average annual loss of 40 to 80 per cent. of the crop. Heart rot and rust of mangolds [*Phoma betae* and *Uromyces betae*] are responsible for losses of approximately 10 per cent. per annum.

Phormium [*tenax*] has been affected to such an extent by yellow leaf [ibid., i, pp. 294, 295] in the Manawatu that the flax-milling

industry is suffering considerably. The quality of the fibre is also impaired in many localities by rust [*Uredo phormii*: ibid., iv, p. 247] and leaf spots.

The annual reduction from disease in the tomato crop amounts to 25 per cent. (or more where precautionary measures are omitted).

The estimated cash losses to New Zealand from plant diseases are as follows: wheat, £137,500; oats, £140,000; barley, £10,000; peas, £24,000; potatoes, £80,000; turnips, £1,800,000; mangolds, £30,000, making a total of £2,221,500. These figures are based on total losses, no account being taken of reductions in yield or of the indirect effect of disease on the milk, meat, and wool yield.

RAMSBOTTOM (J.). **Fairy rings.**—*Queckett Microscop. Club*, Ser. 2, xv, 92, pp. 231–242, 1927.

After a brief and interesting note on popular superstitions concerning the cause and supposedly occult influence of 'fairy rings', the author summarizes succinctly the research work, begun by the seventeenth-century naturalist John Aubrey, which has been done to investigate the cause and manner of growth of these rings. He does not entirely accept the hypothesis put forward by Dr. Bayliss Elliott [*R.A.M.*, v, p. 685] to explain their zonation, and states that, in his opinion, the suggestion of Shantz and Piemeisel that the growth of the mycelium produces profound organic changes in the soil best meets the known facts.

BRONFENBRENNER (J.). **Studies on the bacteriophage of d'Hérelle. VII. On the particulate nature of bacteriophage.**—*Journ. Exper. Med.*, xlv, 5, pp. 873–886, 1 diag., 1927.

When filtrates of lysed cultures (bacteriophage) are subjected to prolonged dialysis under osmotic pressure against water, the presence of the lytic agent can only be detected outside the membrane during the first few days. The residue remaining inside the membrane contains the bulk of the original lytic agent, which is no longer capable of diffusing into the outer solution.

This interruption of diffusion was shown not to be due to any alterations in the permeability of the membranes. The residue also failed to pass through a fresh membrane of similar permeability, while the dialysed portion of the phage does so. When ultrafiltration under pressure was substituted for dialysis, the residue on the filter could be washed repeatedly with water, and again subjected to filtration through the ultrafilter without any more of the active agent passing through. A renewed passage of the active agent through the filter occurred, however, on the substitution of broth for water in washing. These results are interpreted as indicating that the colloidal particles present in the lytic filtrates do not represent autonomous units of the active agent, but merely serve as a vehicle on which the latter is adsorbed. They vary in size within limits wide enough to permit fractionation by means of ultrafiltration. When the coarser particles retained by the ultrafilter are washed with broth, some of the active agent is detached from its coarse vehicle particles, and, in a more highly dispersed form, becomes capable of passing the filter.

BRONFENBRENNER (J.) & MUCKENFUSS (R.). **Studies on the bacteriophage of d'Hérelle. VIII. The mechanism of lysis of dead bacteria in the presence of bacteriophage.**—*Journ. Exper. Med.*, xlv, 5, pp. 887–909, 1927.

The writers have confirmed Twort's and Gratia's obervations [*R.A.M.*, iv, p. 38 ; v, p. 239 et seq.], that dead staphylococci may undergo lysis if, in addition to a suitable bacteriophage, live staphylococci are also present and if the dead bacteria are not added in too great numbers. The phenomenon was further found to be specific, i.e., the lysis of live bacteria is accompanied by lysis of dead bacteria of the same species only. Lysis of dead bacteria occurs best with staphylococci, which readily undergo spontaneous autolysis under suitable conditions. In the case of *Bacillus coli* or *B. dysenteriae* the lysis of the dead bacteria is uncertain. Dead bacteria need not be present at the beginning of the experiment; they will be dissolved if added any time before, during, or after the completion of lysis of live bacteria.

The interposition of a suitable semi-permeable membrane between the dead and the live bacteria prevents the dissolution of the former, notwithstanding the lysis of the live bacteria on the other side of the membrane. The agent determining the lysis of dead bacteria is not diffusible, while the principle initiating the lysis of live bacteria diffuses freely and is demonstrably present on both sides of the membrane. The distinction between the agent responsible for the dissolution of dead bacteria and the bacteriophage can also be shown by the separation of the two agents by filtration, or by adsorption on bacteria.

The ferment-like substance responsible for the lysis of dead bacteria differs from the bacteriophage in being non-diffusible through collodion, easily adsorbed on clay filters, heat-labile, and inactivated on standing.

An agent possessing identical properties was found in cultures of staphylococci undergoing spontaneous autolysis in the absence of bacteriophage, but in this instance the agent appeared in the filtrates considerably later than when the phage was present.

MCDOUGALL (W. B.) & JACOBS (MARGARET C.). **Tree mycorrhizas from the Central Rocky Mountain region.**—*Amer. Journ. of Botany*, xiv, 5, pp. 258–266, 1 pl., 1927.

During the summer of 1925 mycorrhiza were collected from eleven species of trees in the forests of the Rocky Mountains. On *Pinus monophylla*, *Juniperus monosperma*, and three species of *Cercocarpus*, only endotrophic mycorrhiza were found, which have not yet been studied. *Pseudotsuga mucronata* and *Populus tremuloides* yielded both ectotrophic and endotrophic types. *Pinus murrayana* and *Picea engelmanni* showed ectotrophic and ecto-endotrophic types (hyphae from the fungous mantle penetrating into, as well as between, the cortical cells in the latter case), while *Abies lasiocarpa* and *Pinus flexilis* gave only ectotrophic mycorrhiza.

Mycorrhiza are not so abundant in the Central Rocky Mountain forests as in some of the deciduous forests of the east, and they probably do not play so important a rôle in the life of the forest

mushrooms. Each distinct morphological form is undoubtedly produced by a different species of fungus. More than one form on the same species of tree, therefore, indicates symbiotic relations of that species with more than one fungus. On the basis of this criterion *Pinus murrayana* forms mycorrhiza with seven species of fungi, five of which produce ectotrophic forms, and two ecto-endotrophic types.

Ectotrophic mycorrhiza in which the cortical cells are radially elongated on one side of the root, and irregularly shaped on the other, are characteristic of deciduous trees, and are not found on coniferous trees. Penetration by intercellular hyphae is usually deeper in the mycorrhiza of coniferous trees than in those of deciduous trees.

It is considered that the ectotrophic mycorrhiza studied are in all cases parasitic on the roots of the host plants, and the trees are in no way benefited, but may be harmed, by the mycorrhizal relation. This is contrary to the view of Melin [see next abstract], but in accord with those of McDougall [*R.A.M.*, i, p. 397] and Masui [ibid., v, p. 511].

MELIN (E.). **Studier över barrträdsplantans utveckling i råhumus. II. Mykorrhizans utbildning hos tallplantan i olika råhumusformer.** [Studies on the development of conifer seedlings in raw humus. II. The formation of mycorrhiza on Pine seedlings in different forms of raw humus.]—*Meddel. Statens Skogsförsöksanst.*, 23, pp. 433–494, 26 figs., 1927. [German summary.]

In continuation of his previous studies on mycorrhizal formation in *Pinus sylvestris* [*R.A.M.*, v, p. 245], the writer investigated the occurrence of this phenomenon in various types of raw humus. The seedlings grown in humus from a clearing of felled trees (humus form IV) constitute a distinct class as regards their root system. Practically speaking, all the short roots develop into mycorrhiza of the type usually occurring in mild raw humus. These mycorrhiza are formed with great facility, the young roots becoming infected by the fungus immediately they emerge from the mother root. The mycorrhiza formed in this type of humus are relatively long-lived, no trace of decay of the cortical cells being observed among one-year-old plants in November. Isolated mycorrhiza were covered with mycelium of the *Mycelium radicis atrovirens* type. Only a few pseudomycorrhiza were detected. Hyphae of the *M. r. atrovirens* type occurred extensively in roots showing no trace of mycorrhizal formation.

A marked contrast was presented by the seedlings growing in humus form I from open spaces on a heath. Mycorrhizal formation was effected in this case with great difficulty and pseudomycorrhiza predominated. The few mycorrhiza formed were comparatively short lived, the cortical cells of the degenerating individuals showing heavy intracellular infection.

In humus forms II (from a group of young trees among older ones on a heath) and III (from an old, slow-growing fir wood) the mycorrhiza are produced somewhat more easily than in I, but much less so than in IV. The mycelium of *M. r. atrovirens* was much in

evidence, the hyphae assisting in the formation of the pseudomycorrhiza and also developing extensively in the long roots.

The writer is convinced from his previous investigations that the mycorrhiza in form IV represent a case of mutual symbiosis, the seedlings being almost entirely dependent on the mycorrhizal fungi for their food supply. As regards the other humus forms, there is a slight advantage on the side of the fungus symbiont, especially where the mycorrhiza are constituted by species of *Boletus*.

Generally speaking, well-developed seedlings showed profuse mycorrhizal formation, while in feeble plants the mycorrhiza were scanty. The author discusses the possible reasons for this correlation and arrives at the conclusion that the varying development of the mycorrhiza is primarily due, directly or indirectly, to the different types of humus, some of which contain much larger quantities of mycorrhiza-forming mycelia than others. Soil Hymenomycetes are known to be more plentiful in young, thriving plantations than in older ones. The best mycorrhiza are found in the layer of decaying matter in loose raw humus, their development presumably being favoured by the mobilization of nitrogen or associated factors.

BARBER (H. H.). **The production of fat by a species of Penicillium grown in sucrose solution.**—*Journ. Soc. Chem. Indus.*, xlvi, 20, p. 200 T, 1927.

A pure culture of an apparently new *Penicillium* was isolated from various moulds growing on a starch mixture in a lace-finishing works at Nottingham. The fungus produced a vivid red colony on starch paste or solid sucrose media, and in sucrose solutions rapidly turned the liquid deep red. The orange-yellow ether extract derived from the superficial mycelium of the fungus consisted mainly of a semi-solid fat soluble in light petroleum. The fat was of a light yellow colour, had a melting-point of 13° C., and was sparingly soluble in hot alcohol. The saponification value was 183, 197, and 204 in three different samples, the last-named figure resulting from prolonged hydrolysis. Two fatty acids were obtained in approximately equal proportions. The saturated acids had a melting-point of 50·5° and solidified at 49° to a pale yellow, crystalline mass, while the bright yellow unsaturated acids were liquid at ordinary temperature.

Each culture flask containing 500 c.c. of a 5 per cent. aqueous solution of sucrose with a reaction of P_H 4·0 to 4·5 gave an average yield of 3 to 4 gm. of dry residue with approximately 14 per cent. of fat.

WILLE (F.). **Untersuchungen über die Beziehungen zwischen Immunität und Reaktion des Zellsaftes.** [Investigations on the relations between immunity and the reaction of the cell sap.]—*Zeitschr. für Pflanzenkrankh. und Pflanzenschutz*, xxxvii, 5–6, pp. 129–158, 3 graphs, 1927.

A series of investigations was undertaken in the canton of Valais (Switzerland) to examine the possible connexion between the occurrence of discolorations (probably associated in most cases with

incipient fungous infections) on vine leaves and conifer needles and the reaction of the cell sap.

The determination of the hydrogen-ion concentration of aqueous vine leaf extracts of thirteen commonly grown varieties was made by the colorimetric method. The minimum degree of acidity, which fluctuated in the different varieties, was uniformly found to coincide with the flowering period towards the end of May. No definite connexion could be traced between varietal susceptibility to downy mildew (*Plasmopara viticola*) and roter brenner (*Pseudopeziza tracheiphila*), the two fungi most likely to be implicated in the discolorations, and the hydrogen-ion concentration of the cell sap, but the discoloration was clearly shown to be associated with a minimum degree of acidity. Probably the fungi in question find favourable conditions for infection in the acid minimum prevailing at the time of their appearance. Previous records show that the ash content of the leaves at the critical period is relatively high, so that a deficiency of neutralizing alkalis can scarcely be involved.

The examination of the needles of various species of conifers showed a decline of the hydrogen-ion concentration with increasing age. This relation was also apparent in the Scotch pine (*Pinus sylvestris*) and fir (*Picea excelsa*) needles of individual years in the course of one season. The fungi implicated in the discoloration of conifer needles are *Lophodermium pinastri* [*R.A.M.*, vi, p. 452], *Hypodermella sulcigena*, and possibly the facultative parasites *Nectria cucurbitula*, *Cenangium abietis* [ibid., vi, p. 264], and *Valsa pini*, all of which occur in an epidemic form in certain seasons. In the regions under observation, *L. pinastri* first appears about the end of May or early June, i. e., at the period of minimum acidity, before the needles have attained their maximum length. Pycnidia are formed in abundance, but the profusion or scarcity of conidial production appears to depend on the meteorological conditions of the winter. These bodies have only been produced in large numbers three times during the last eight years. In general a relation between minimum acidity and the occurrence of brown needles was apparent but was less clearly marked, owing to the more irregular fluctuations of the former, than in the case of the vine.

SCHLUMBERGER (O.). **Die Übertragung von Kartoffelkrankheiten durch die Pflanzknollen.** [The transmission of Potato diseases through the tuber.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlii, 24, pp. 637–641, 1927.

This paper gives a popular account of the methods of transmission of potato diseases through the use of affected tubers as seed. It distinguishes between those that are carried on the surface of the tuber (whether the latter be injured or not by their presence) such as *Rhizoctonia* [*Corticium solani*], common scab [*Actinomyces scabies*], powdery scab (*Spongospora solani*) [*S. subterranea*], and the like, and those carried internally without superficial evidence of their presence, such as *Verticillium* [*albo-atrum*] and the virus diseases, leaf roll and mosaic. The influence of weather and cultivation on the transmissibility of these diseases is discussed. The author's experience leads him to the conclusion that infection from

previously contaminated soil is at least as common a source of many of these diseases as the use of infected seed.

The susceptibility of different potato varieties for several of these diseases is indicated.

MOORE (H. C.). **Results of Potato spraying and dusting experiments 1926.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, ix, 4, pp. 131–133, 1927.

The writer describes the following experiment conducted at the Michigan State College to determine the comparative efficacy of spraying and dusting for the control of insect pests and fungous diseases of potatoes. Three plots (one-ninth acre each) received five applications of a dehydrated copper sulphate and hydrated lime dust (25–75) at the rate of about 30 lb. per acre. Three similar plots were sprayed five times with Bordeaux mixture (4–4–50) at the rate of approximately 100 galls. for each application. Certified seed of the Russet Rural variety was used and four plots were left untreated as controls. Early blight [*Alternaria solani*] and leaf hoppers were the only troubles of any importance during the season, and both were well controlled by the treatments. The total yield per acre was 188·4 bushels in the sprayed plots, 177·5 in the dusted and 127·5 in the untreated. In a similar test carried out in Oakland County, the total cost per acre for dusting and spraying (four applications) was $10·76 and $7·06, respectively, and the total yields per acre were 263 bushels in the sprayed plot, 252 in the dusted, and 238·9 in the control.

MILLARD (W. A.) & TAYLOR (C. B.). **Antagonism of micro-organisms as the controlling factor in the inhibition of scab by green-manuring.**—*Ann. of Appl. Biol.*, xiv, 2, pp. 202–216, 2 pl., 1927.

The experiments described in this paper were designed to test the theory that, in the presence of green manure, saprophytic species of *Actinomyces* may become dominant over parasitic ones, and by secretion of a toxin, or by means of their greater success in the competition for the available food, the former may kill off the more weakly growing parasitic forms. Potatoes were grown in series of pots containing soil only or soil mixed with grass cuttings. In each series the pots were inoculated with *Actinomyces scabies* (a virulent parasite) and *A. praecox* (an obligate saprophyte). In experiment 1 the inoculum of *A. scabies* was made to decrease, and that of *A. praecox* to increase along the series of pots. In experiments 2 and 3 the inoculum of *A. scabies* was kept constant and that of *A. praecox* increased along the series.

In the absence of the saprophytic species, grass alone exerted no inhibitory action on scab. When both species were inoculated into soil or soil mixed with grass, a reduction of scab was obtained. This reduction was most marked in the case of the maximum inoculation with *A. praecox*. Counts of the two species of *Actinomyces* made from soil samples taken from the pots showed that the presence of the saprophytic species exerted a strong depressing

effect on the parasitic one, especially after a whole season's growth. The millionth dilution platings from a pot inoculated with *A. scabies* alone yielded 225 colonies ; but no colonies of this species were found on the plates of the same dilution in the case of three pots which had also been inoculated with *A. praecox*. That the inhibitory effect of the latter on *A. scabies* was not due to the setting up of an unfavourable soil reaction was shown by determining the P_H values. The writers state that it was probably caused by a starving out of the weaker organism in competition for the available food supply in the soil. It is suggested that the beneficial effect of green manuring on scab of potatoes under field conditions is due to similar competitive action, and that in this competition the bacteria as well as actinomycetes may play a part. The cases in which green manuring has apparently failed to inhibit scab are considered from this fresh point of view.

DUFF (G. H.) & WELCH (CATHERINE G.). **Sulphur as a control agent for common scab of Potato.**—*Phytopath.*, xvii, 5, pp. 297–314, 1 diag., 1927.

In this paper the authors discuss the results [which are also presented in tabular form] of nine experiments, conducted in 1923 in Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Manitoba, and Saskatchewan, to ascertain (1) whether sulphur is equally effective in the control of potato scab (*Actinomyces*) [*scabies*] on all soils and under all conditions; and (2) if the lethal effect of sulphur on the scab fungus is always solely or mainly dependent on the increased acidity following its oxidation in the soil [*R.A.M.*, iii, p. 231]. It was found that sulphur, applied at the rate of 400, 600, 900, or 1,200 lb. per acre, was not uniformly effective in the control of scab, but gave promising results only on clay soils infested by moderate numbers or by attenuated strains of the organism, and under conditions of light rainfall. An analysis of the experimental results further showed a conspicuous absence of any constant correlation between scab control and soil acidity. Failure to effect satisfactory control was not invariably coupled with the absence of a significant increase in soil acidity; while, conversely, plots in which there was no substantial acidification showed adequate control of scab in one of the tests. These apparent inconsistencies point clearly to the complex nature of the scab control problem.

No constant or appreciable difference was observed in the comparative efficacy of inoculated sulphur or flowers of sulphur.

SCHANDER [R.]. **Neuere Arbeiten über die Blattrollkrankheit.** [New work on leaf roll.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlii, 23, pp. 613–615, 1927.

Attention is called to Lindner's work (*Deutsche Landw. Presse*, liii, 43, 1926) on the relation between the state of maturity and the chemical composition of potato tubers and especially on the connexion between high amide content of the tuber on the one hand and vigour of germination and subsequent growth of the

daughter plant on the other. It is suggested that such vigorous plants are not susceptible to degeneration. The author describes some investigations which tend to support this view, especially in the case of early varieties. He reiterates his conviction that leaf roll of potatoes is a physiological disease [*R.A.M.*, vi, p. 633] and is not prepared to accept the view that it is due to infection by a virus.

MEGAW (W. J.). **Notes on experiments relating to loss of vigour in stocks of Potatoes.**—*Journ. Min. Agric. Northern Ireland*, i, pp. 37–45, 6 pl., 1927.

This paper describes in some detail a series of experiments carried out in 1924 at the Plant Breeding Station at Stormont in Northern Ireland to investigate the influence of change of seed upon loss of vigour in potato stocks. Twenty-four varieties of potato were used, and the various stocks were as follows:—old stocks grown in potato trials during several preceding years, one-year-old stocks, and new stocks, the seed of which was obtained in various parts of Northern Ireland and Scotland. Some of the old stocks were the produce of crops affected with leaf roll, but the new and the one-year-old stocks were from apparently healthy crops.

Frequent examination showed that leaf roll appeared in all stocks affected the year before, and in a large proportion of the crops grown from one-year-old seed, but crops grown from the new stocks of seed were unaffected. Most of the crops showed signs of mosaic and crinkle.

The low yields obtained from the old stocks were found due mainly either to leaf roll, or to leaf roll and mosaic combined. The yield, however, was not seriously diminished until a stock had carried infection for two seasons. Deterioration was most rapid in the earlier districts, but the later districts of Northern Ireland are considered specially suitable for producing healthy, vigorous stocks of seed potatoes, and it is suggested that farmers in the earlier districts could increase the yield of their potato crops by procuring frequent changes of seed from the later districts.

The percentage of chats [small tubers] in the old stocks affected with leaf roll was much higher than in new stocks free from the disease. This is considered to indicate that the yearly planting of small tubers in a district where potatoes are liable to virus diseases increases the rate of deterioration of stocks. The author adds that any serious appearance of leaf roll or mosaic in a potato crop indicates that a change of seed is necessary.

CARNE (W. M.). **Mosaic and leaf roll of Potatoes.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 2, pp. 322–329, 4 pl., 1927.

After a brief historical summary, the author describes in popular terms the symptoms and manner of infection of mosaic and leaf roll diseases of potato. Various methods of obtaining seed relatively free from these diseases are also suggested.

ROACH (W. A.). **Immunity of Potato varieties from attack by the wart disease fungus, Synchytrium endobioticum (Schilb.) Perc.**—*Ann. of Appl. Biol.*, xiv, 2 pp., 181–192, 2 pl., 1927.

Since it is known that grafting together portions of two different plants is sometimes followed by changes in their chemical contents owing to permeation of each by substances formed in the other, the present work was undertaken to determine, by grafting together pieces of immune and susceptible potato plants, whether the cause of immunity from wart disease (*Synchytrium endobioticum*) is carried by chemical compounds which can traverse unchanged a graft fusion layer, or by those which are unable to do so. The work was carried out by building up all the eight possible types of plants by grafting together root, shoot, and tuber systems from both immune and susceptible plants, and testing the tubers formed for any resulting effect in their reaction towards the disease [*R.A.M.*, iii, p. 234]. In none of these experiments was the immunity or susceptibility of the resulting tubers found to be changed. The conclusions are, therefore, drawn that the reaction of any piece of potato tissue towards wart disease is independent of the influence of any foreign tissue grafted on it; that the cause of immunity from or susceptibility to this disease is innate in the cell and unable to move thence except by cell division; and that it is not influenced by substances which pass unchanged across a graft fusion layer and permeate the tissues of the other component of the composite grafted plant. Susceptibility to wart disease is, therefore, different in nature from susceptibility to crown gall [*Bacterium tumefaciens*: ibid., iv, p. 222].

Previous theories, which regard the cause of immunity from wart disease as lying in a definite substance capable of diffusion through the plant, e.g., a compound built up in the leaves and transported thence [ibid., iii, p. 547], are thus considered to be erroneous. The cause of immunity must be found in one or other of those chemical compounds which constitute the permanent 'structure' of the cell. Since this compound does not appear to leave the cell, it seems likely that immunity is a property of the protoplasm. It is suggested that an examination of the proteins from immune and susceptible varieties by immuno-chemical methods may give some clue as to the real cause of immunity in the case of this disease.

KÖHLER (E.). **Ueber das unterschiedliche Verhalten der Kartoffelsorten bei Krebsbefall (Synchytrium endobioticum). (Vorläufige Mitteilung).** [Notes on the different behaviour of Potato varieties in regard to attack by wart disease (*Synchytrium endobioticum*). (Preliminary report.)]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 5, p. 44, 1927.

Preliminary results of the author's further investigations of the potato wart disease (*Synchytrium endobioticum*) [*R.A.M.*, vi, p. 502] indicate that potato varieties fall into two natural groups, of which one is susceptible and the other resistant to the disease, and which may be recognized by their different reaction to experimental infection in greenhouses. The various responses of both groups to infection are contrasted in a short table.

YATZININA (CLAUDINE N.). Болезни Картофеля. (Предварительный отчет о работе за **1923–1925** гг.) [Potato diseases. (Preliminary report on the work done in the years 1923 to 1925.)]—Reprinted from *Труды Оп.-Исслед. Участка Ст. Защ. Раст. от Вред. Моск. Зем. Отдела.* [*Trans. Exper. & Res. Section Moscow Plant Protect. Stat.*], *1927*, 1, 51 pp., 1927.

This paper is a progress report of the investigation, started in 1923, of the potato diseases prevalent in the government of Moscow, particularly of the tuber rot caused by *Phytophthora infestans*, which is stated to be responsible year after year for heavy losses both to the crop in the field and to stored potatoes. Up to 1925 attention was mainly directed to finding varieties resistant to or immune from the disease, the indications being that while no variety showed entire immunity, the Silesia, Granate, Paltchiki, Epicure, Wohltmann, Asa, Nestor, and Svitez varieties exhibited a high degree of resistance to late blight while growing and to tuber rot when stored. The work is still being continued and is planned to include the influence of agricultural methods, manuring, and environmental conditions on the development of the disease.

Spraying experiments against *P. infestans*, stated to be the first that have been attempted in Russia, confirmed the efficacy of 1 per cent. Bordeaux mixture, applied once or twice after the appearance of the first symptoms, in the control of late blight and in increasing the yield. Lime-sulphur sprays proved to be almost ineffective against the disease, and to have a depressing effect on the growth of the plants and their yield.

MOORE (H. C.). **Hollow heart of Potatoes.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, ix, 4, pp. 137–139, 1927.

A series of experiments was conducted at the Michigan State College in 1926 to determine the comparative effects of nitrates, phosphates, and potash, used separately and in combination, in the production of hollow heart of potatoes [*R.A.M.*, v, p. 516]. Certified Russet Rural tubers were planted on sandy loam soil, and treated with the various fertilizers at the rate of 1,000 lb. per acre. The highest incidence of hollow heart (15·27 per cent. by weight) occurred in the plots receiving potash alone, and the lowest (2·78 per cent.) in those treated with nitrates plus phosphates. Plots fertilized only with nitrates gave 7·83 per cent. infection and only with phosphates 6·67 per cent., whilst the untreated showed 7·29 per cent. diseased. The first hollow potatoes were observed on 30th August, 82 days after planting, and by 4th October the incidence of the disease had risen from 3·56 to 10·86 per cent. It was found that the most hollow heart occurred in hills with only one stalk (22·51 per cent. compared with 12·25, 7·75, and 5·96 per cent. in the hills with two, three, and four stalks, respectively). The results of an experiment conducted in Oceana County showed that close spacing (32 by 16 and 34 by 17 inches) reduced the incidence of hollow heart to 2 and 7·84 per cent. compared with 13·7 and 30·90 per cent. in plots where the spacing was wide (32 by 32 and 34 by 34 inches).

BALLY (W.). **De tegenwoordige stand van het vraagstuk van de meeldauw ziekte in de Hevea.** [The present status of the question of the mildew disease of *Hevea*.]—*Meded. Proefstat. Malang*, 61 (*Arch. voor Rubbercult. Nederl.-Indië*, xi, 5), 30 pp., 2 figs., 2 diags., 1927.

The widespread anxiety felt in Dutch East Indian rubber circles concerning the steadily increasing ravages of *Hevea* rubber mildew (*Oidium heveae*) [*R.A.M.*, v, p. 629] has led the writer to investigate the economic importance of this disease.

In Malang, as elsewhere, the virulent phase, during which the ground is covered with freshly fallen leaves, generally lasts only a very short time. Much more conspicuous are the subsequent manifestations of the disease, including the development of a second growth of foliage and the die-back of the branches, which may, however, also be due to physiological causes or to secondary infection by *Botryodiplodia* [*theobromae*].

The morphology and taxonomy of the causal organism are discussed. The writer has sometimes found longer chains of conidia than Steinmann [ibid., iv, p. 702] (up to five instead of one or two). The species is evidently identical with that occurring in Ceylon, but the conidia of the Malang strain examined by the writer measure 25 to 30 by 14 to 17 μ, compared with 28 to 42 by 12 to 23 μ reported by various workers.

The life-history of the fungus is briefly described and its incidence in relation to weather discussed. In Malang it would appear that in a damp east monsoon the rubber mildew breaks out suddenly and rapidly comes to a standstill, whereas in dry weather during this period infection is gradual but severe. The abrupt disappearance of the mildew at a given moment is partly due to the fact that mature rubber leaves, with their thick outer cell walls, are no longer readily penetrable by the haustoria of the fungus.

Three hypotheses are advanced to explain the carrying over of *O. heveae* through the period when the disease is not active. (1) Perithecia and ascospores may be produced, though no trace of these fructifications has yet been found on fallen leaves or peduncles. (2) The mycelium may overwinter in the leaves or branches of the trees, for though no exact data are available in this connexion, the fact that the disease was observed on young shoots during the west monsoon (middle of January) is thought to point to mycelial hibernation. (3) *O. heveae* may comprise biological strains capable of parasitizing other hosts: mildews are known to occur in Java and Ceylon on various other Euphorbiaceae and the possibility that one of these may be involved should be carefully investigated, especially in the case of that widely prevalent on *Jatropha curcas*.

Discussing the effects of mildew on rubber trees, the writer expresses the opinion that no appreciable respiratory or metabolic disturbances occur as the result of infection. The death of the young leaves would appear to be due to toxins emanating from the haustoria. The die-back of the branches and trunks is a consequence of the depletion of the carbohydrate reserves resulting from the repeated fall and renewed formation of the leaves. Little can be said as to the economic importance of rubber mildew until

accurate statistics of production in diseased and healthy trees are available.

An account is given of some preliminary spraying experiments for the control of mildew carried out by Messrs. T. G. E. Hoedt and Björklund under the author's supervision in 1926. Four types of apparatus were used, namely, a knapsack sprayer containing about 20 l. of spray fluid, supplied by O'Herne (Ambarawa); an equipment furnished by Schlieper, which is constructed to hold some 60 l.; the O. S. F. Headland pump (Drake and Fletcher, Maidstone), operated at a pressure of 150 to 200 lb. per sq. inch; and an apparatus manufactured by van Baak and Wis (Smeroe). All these equipments gave satisfactory results, the Headland being the most powerful and effective. Of the fungicides tested, lime-sulphur (3 kg. sulphur, 3 kg. quicklime, and 30 l. water) caused defoliation; Bordeaux mixture, solbar, and elosal gave adequate control under the relatively mild conditions of the experiments. Sulfinette (MacDougal, Manchester), like solbar and elosal, has the advantage of immediate solubility. In the absence of accurate knowledge of the economic importance of rubber mildew, no estimate can yet be formed as to the probable value of spraying. Similarly, the efficacy of indirect control measures (manuring and selection of resistant individuals) cannot yet be determined.

THRUPP (T. C.). **The transmission of 'mosaic' disease in Hops by means of grafting.**—*Ann. of Appl. Biol.*, xiv, 2, pp. 175–180, 1 pl., 1927.

After describing the typical symptoms of mosaic disease of hops [*R.A.M.*, ii, p. 381], the writer gives an account of experiments on the grafting of healthy and diseased bines. When using healthy material, grafted before the end of May, 87·5 per cent. of the grafts succeeded, while with diseased stocks the percentage successful was only 14·3. The upward passage of the supposed virus from mosaic stock was demonstrated by grafting 94 tips of several susceptible commercial varieties on to mosaic stock. Of the 12 grafts which took and grew, all developed mosaic symptoms with one doubtful exception. Two male hop scions took but showed no signs of the disease, as did two scions of the variety M 45.

That the variety M 45 acts as a carrier [ibid., iii, p. 289] was proved by grafting scions of the varieties Tutsham, Eastwell Golding, Farnham Whitebine, wild hops C, B, D, and E, and male hops on to this stock. The first four sets of grafts of susceptible varieties developed mosaic symptoms, while the others did not.

BLATTNÝ (C.). **Peronospora (falscher Meltau) des Hopfens. Pseudoperonospora humuli (Miyabe et Takahashi) Wils.**—[*Peronospora* (downy mildew) of the Hop. *Pseudoperonospora humuli* (Miyabe et Takahashi) Wils.]—*Sborník vyzkumných ústavii zemědělských RČS, (Recueil de trav. des Inst. des Recherches agron. de la République Tchéchoslovaque*, Sv. 27 a, pp. 5–274, 297–299, 301–304, 1 col. pl., 50 figs., 6 diags., 2 graphs, 1 map, 1927. [French summary.]

In this comprehensive survey of the present range and importance of downy mildew of hops (*Pseudoperonospora humuli*) in

Czecho-Slovakia, the writer states that the disease was first definitely detected on 21st May, 1926 [*R.A.M.*, vi, p. 254] but had been present for two years previously [see also next abstract]. During the rainy periods from May to June, and again in September and October, infection spread to such an extent that scarcely a single healthy garden could be found by the close of the season.

The influence of meteorological conditions on the development of the fungus is discussed and the results of the writer's observations on temperature relations and rainfall are tabulated. Field and greenhouse studies showed that infection by zoospores from the sporangia occurs at temperatures of about 16° C. and upwards, while the oospores germinate and infect the shoots or eyes in the spring at or above 11°. [It does not appear that the author has actually germinated oospores or secured infection from them under controlled conditions.]

The gradual spread of downy mildew in Czecho-Slovakia is traced and its influence on the plants described. The actual financial loss was inconsiderable in 1926, the effects of the disease at this early stage of its development being chiefly confined to modifications in the colour of the dried hops.

The author distinguishes and fully describes several different types of symptoms produced by downy mildew on the leaves, axes, and cones, which may be attacked either from without or by the internal mycelium. The latter mode of infection involves the desiccation and stunting of the flowers, the deformation, discoloration, and shrivelling of the cones, and the invasion of the spindles, while infection by conidia is accompanied by a discoloration either in the form of spots or involving the whole of the cones.

Under Czecho-Slovakian conditions, the bulk of infection is believed to result from oospores in April and May. The fungus was not found in the parent stocks underground or in the woody portions of the cuttings, and the mycelium was very rarely detected in the eyes. The possibility of a saprophytic overwintering of the mycelium in the soil is not excluded, and it is also possible that the oospores may be carried by the cuttings. Infection by conidia or zoospores may occur on either side of the leaf. The conidia do not retain their virulence for more than ten days at the most. The growth of the mycelium in the plant is mostly acropetal, occasionally also basipetal.

Discussing the possible methods of introduction of the downy mildew into Czecho-Slovakia, the writer concludes that the fungus was probably carried by the wind over the Erzgebirge (where wild hops, infected two years previously, were found in 1926) from the infected regions of Germany in the north, and also from those of Jugo-Slavia (where the disease was first observed in 1923) in the south. Both in Hungary and Slovakia a very widespread infection of wild hops has been found. The original home of both *P. humuli* and its host is the Far East, and the fungus may either have reached Central Europe direct by way of the Carpathians, or have been introduced into England through the Mediterranean regions and France, and thence to Middle Europe.

All attempts to transfer *P. humuli* from hops to nettles (*Urtica dioica*), and *P. urticae* from nettles to hops gave negative results.

The morphological characters of these two species of *Pseudoperonospora*, which are considered to be distinct, are compared, and the symptoms of the disease on nettles described. Certain variations exist between the strains of *P. humuli* from different regions, but these are not considered to be such as to justify the separation of the species into distinct races. The locality and the host appear to be of less importance in the formation of conidiophores and conidia than the season and the virulence of the fungus, which increases with each successive year of attack.

P. humuli was successfully grown on healthy hop leaves washed in sterile water and laid on filter paper in Petri dishes. Fertile conidiophores were produced in six and seven days, respectively, on two out of five leaves inoculated on the under side with a conidial suspension at about 20° C. Three days later spots developed on the dying tissue. Attempts to cultivate the fungus in artificial media failed.

The author is convinced that downy mildew will prove a permanent menace to the cultivation of hops in Czecho-Slovakia. In a chapter on the disease in foreign countries up to 1926 he summarizes his own observations and those of other workers in Germany and Jugo-Slavia.

The activities of the Czecho-Slovakian Ministry of Agriculture and of the various hop-growing organizations in connexion with the control of downy mildew are briefly outlined. The problem of control is discussed at some length, full directions being given for the application of sanitary and cultural measures, and for the treatment of the hops with 0·75 to 1 per cent. Bordeaux mixture. Some notes are given on varietal resistance, from which it appears that wild varieties are generally very susceptible, as are also the cultivated German varieties, and the so-called old Bohemian red hops in the south. An undetermined English variety of the Golding type proved highly resistant, and imported Japanese and Russian hops moderately so.

Descriptions are also given of various forms of virus diseases of hops occurring in Central Europe, viz., mosaic of Golding hops (an affection of the aucuba type); 'squirt' mosaic, transmissible from diseased to healthy plants by the leaf-insect *Calocoris fulvomaculatus*; mottled mosaic; hereditary sterility; and yellow spot mosaic and hop curl (possibly identical with nettlehead) [ibid., v, p. 127]. Notes are also given on infection by *Macrosporium* sp., *Botrytis cinerea*, a species of *Fusarium* allied to *F. culmorum*, *Septoria humuli*, *Ascochyta humuli*, a species of *Cercospora* possibly identical with *C. cantuariensis* [ibid., iv, p. 635], *Synchytrium aureum*, *Alternaria* sp., and other fungi.

BAUDYŠ (E.). **Falscher Hopfenmeltau in Mähren.** [Downy mildew of Hops in Moravia.]—*Sborník výzkumných ústavii zemědělských RČS. (Recueil de trav. des Inst. des Recherches agron. de la République Tchéchoslovaque)*, Sv. 27a, pp. 277–295, 10 figs., 1 diag., 1927.

The writer has studied the downy mildew of hops (*Pseudoperonospora humuli*) [see preceding abstract] in Moravia. The symptoms of the disease are described and differentiated from those of

mosaic and other virus diseases, and an account is given of experiments [the results of which were negative] in the transmission of infection from hops to nettles. The writer is opinion that downy mildew has been present in Czecho-Slovakia for some time without attracting attention, and states that it was definitely determined on wild hops by Petrak near Weisskirchen (Moravia) in 1924. Directions are given for the control of the disease by fertilization with compost instead of stable and liquid manure, and by the use of kainit and basic slag, as well as by preventive spraying with Bordeaux mixture, and by the selection of resistant varieties.

RAYBAUD (L.). **Le mildew du Houblon (Pseudoperonospora humuli) en Lorraine.** [Hop mildew (*Pseudoperonospora humuli*) in Lorraine.]—*Comptes rendus Soc. de Biol.*, xcvi, 14, pp. 1164–1166, 1927.

The first appearance of downy mildew of the hop (*Pseudoperonospora humuli*) in Lorraine was reported to the author from Lucey, near Toul, early in June, 1926. Since that date the disease has been observed at other localities of Meurthe-et-Moselle. The early Alsatian Spalt and the Petit Vert de Lorraine varieties appear to be resistant, while the Strissel Spalt and Saaz (especially the latter) are susceptible. Attempts to produce the symptoms of downy mildew on hops by inoculation with nettle mildew [*P. urticae*] gave negative results. The disease, which is thought to have been favoured by excessive drought and north winds, was well controlled by repeated applications of 1·5 to 2 per cent. Bordeaux mixture. Other control measures should include the choice of elevated sites with a free circulation of air; the substitution of wires for props; and disinfection of plant-holes with a solution of 3 parts each of copper sulphate and sulphuric acid to 100 parts of water.

NEUMANN (O.). **Der heimische Hopfenbau 1927.** [The home Hop industry in 1927.]—*Wochenschr. für Brauerei*, xliv, 21, pp. 241–242, 1927.

Attention is drawn to the heavy damage caused in German hop gardens during 1926 by the *Peronospora* disease [*Pseudoperonospora humuli*], and to the measures adopted for its control by the various organizations concerned. The fears expressed by representatives of the brewing interest that spraying with Bordeaux mixture might impair the flavour of beer prepared from treated hops are stated to have proved groundless. Emphasis is laid on the need for a continuation of an energetic campaign against this destructive disease.

MERKENSCHLAGER (F.). **Neue Arbeiten zur Peronosporakrankheit des Hopfens.** [Recent work in connexion with the *Peronospora* disease of Hops.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 5, pp. 41–43, 2 figs., 1927.

In this paper the principal recent literature on downy mildew of hops (*Peronospora*) [*Pseudoperonospora humuli*] is briefly reviewed with explanatory comments.

SIEMASZKO (W.). **Mączniak rzekomy Chmielu (Pseudoperonospora humuli Wilson) w Polsce.** [Downy mildew of Hops (*Pseudoperonospora humuli* Wilson) in Poland.]—Reprinted from *Gazeta Rolnicza* [*Agric. Gaz.*], *1927*, 27–28, 12 pp., 1927.

This paper, which gives a semi-popular description of the downy mildew of hops (*Pseudoperonospora humuli*) [*R.A.M.*, vi, 373], contains the first official record of the appearance in 1927 of the disease on wild and cultivated hops in the valley of the Vistula in Poland, although from a sample of hop cones from the preceding season it would appear that in certain localities the disease was already present in the country in 1926. The author's observations tend to disprove the view that the organism from the hop can infect stinging nettles [*Urtica*] and vice versa, as he found heavily mildewed nettles growing in immediate proximity to entirely healthy hops, and the reverse. In Poland the disease appears to be still in its initial stage and only of sporadic incidence, and the paper is meant as a warning to hop-growers to take the necessary control measures, which are briefly described.

KORFF & HAMPP. **Abteilung für Pflanzenschutz. Beobachtungen am Hopfen.** [Division of Plant Protection. Observations on Hops.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 2, p. 53, 1927.

A species of *Fusarium* was isolated from hops suffering from foot rot [*R.A.M.*, v, p. 126]. Outbreaks of downy mildew (*Peronospora*) [*Pseudoperonospora humuli*] have been observed in various hop gardens of Bavaria, the first symptoms appearing on the under side of the leaves on the 29th April. Brief directions are given for the control of the disease by the application of 0·5 per cent. Bordeaux mixture.

PETCH (T.) & RAGUNATHAN (C.). **The fungi associated with disease in Vanilla.**—*Ann. Roy. Bot. Gard., Peradeniya*, x, 2, pp. 181–196, 2 pl., 1927.

The four fungi regularly associated with soft rot of *Vanilla planifolia* in Ceylon [*R.A.M.*, iii, p. 553] have been studied in pure culture from single spores on maize meal agar and are fully described in the present paper.

Species A is a *Botryosphaeria*, with a *Volutella* imperfect stage. The black, opaque, globose-conoid or flask-shaped perithecia are 280 to 350 μ in height and 245 to 280 μ in diameter. The clavate asci measure 117 to 140 by 12 to 17 μ and contain eight biseriate, hyaline, continuous, allantoid ascospores, measuring 25 to 35 by 8 to 11 μ. Long, slender paraphyses are present. The setae are dark brown, straight, septate, subacute, slightly bulbous at the base, 105 to 235 μ in height by 3 to 5 μ at the base. This species is regarded as undoubtedly identical with *Gnomoniopsis vanillae* Stonem. and probably with *Calospora vanillae* Mass. It is renamed *B. vanillae* (Stonem.). The *Volutella* stage has branched conidiophores and cylindrical, straight or slightly curved conidia, 22 to 35 by 7 to 11 μ. It is identical with *Vermicularia vanillae* Delacr. and is renamed as *Volutella vanillae*.

Species B, the fungus most frequently associated with soft rot of

vanilla, is a *Glomerella*, with a *Gloeosporium-Colletotrichum* imperfect stage, which produces a few olive-brown, septate, obtuse, somewhat irregular setae, measuring 55 to 105 by 4 to 5 μ. The conidia are cylindrical, sometimes acute at one end, and 12 to 20 by 3 to 6 μ. The subconoid perithecia are black (pale at the apex) and measure up to 200 μ in diameter and 175 μ in height. The lanceolate or clavate asci, measuring 54 by 12 μ, contain obliquely biseriate, fusoid or subcymbiform, curved, continuous, hyaline ascospores, with subacute ends, measuring 14 to 20 by 5 to 6 μ. This species is evidently *Physalospora vanillae* Zimm. referred by Shear and Wood to *Glomerella cingulata*, but regarded by the authors as distinct and is renamed *Glomerella vanillae* (Zimm.).

Species C is a *Gloeosporium-Colletotrichum* which produces setae only in culture and then sparingly. They are black, acute, and measure 80 to 105 by 2 to 3 μ. The conidia are oblong-oval to cylindrical, measuring 12 to 18 by 5 to 6 μ. This species forms a dark, compact, basal stroma in culture.

Species D is a *Gloeosporium-Colletotrichum* which regularly produces olive-brown, sometimes flexuose setae, measuring 70 to 135 by 4 to 5 μ. The conidia are ovate or narrow oval, hyaline, continuous, and measure 12 to 25 by 3 to 7 μ.

There are a number of possible names for species C and D, and the imperfect stage of B, but no definite conclusions can be reached without examining the type specimens. It would appear probable that Massee's *Hainesia* and *Cytospora* (*Kew Bull.*, p. 111, 1892) were both the same *Gloeosporium* and identical with the Ceylon species C.

The majority of the inoculation experiments, which were carried out under conditions closely approximating to those obtaining in nature, were unsuccessful, and the results are regarded as without significance. Eight of the nine successful inoculations were on pieces of stem.

Amongst other fungi recorded on vanilla in Ceylon are a *Phyllosticta* (probably *P. vanillae*), and a *Mycosphaerella* (possibly identical with *Laestadia traversi* Cav.), both occurring in conjunction with *Colletotrichum* species D.

Natal Sugar Experiment Station. Annual Report for the year 1926–1927.—*South African Sugar Journ.*, xi, 5, pp. 319–339, 1927.

This report contains the following references of phytopathological interest. The Toledo, Kassoer, Oshima, Kinar, and Kavangire varieties of sugar-cane supplied by the United States Department of Agriculture [*R.A.M.*, v, p. 697] have maintained their characteristic hardiness and resistance to drought, cold, and mosaic disease. Other promising varieties under observation include C. H. 64/21, a hybrid of Uba and D. 74 from Chapara, Cuba; Merthi, a thin cane of the Uba type; S. C. 12/4, a seedling originating in Barbados; a Cuba cane believed to be identical with C. H. 64/21; the Coimbatore seedlings Nos. 205, 210, 213, 214, and 281; P. O. J. 2714, 2725, Tjepiring 24, and E. K. 28 from Java; Hind's Special from the Philippines [ibid., ii, p. 468]; U. D. I. (a hybrid of Uba and D. 1135) from Hawaii; and Uba Marot from Mauritius. Very satisfactory

results on a small scale have also been given by the Queensland varieties Badila (N. G. 15), D. 1135, and 1900 Seedling (originating in Mauritius), together with the so-called Argentine Selection.

McClean (A. P. D.). **The mosaic campaign. Latest information regarding the position.**—*South African Sugar Journ.*, xi, 5, pp. 297–298, 1927.

Some details are given in connexion with the progress of the sugar-cane mosaic campaign in South Africa. In Zululand only about 3½ out of 32 acres of susceptible canes have been eradicated during the past year to make room for the resistant Uba variety, but in Natal the 140 acres under susceptible varieties have been reduced to less than 20. Large numbers of volunteer stools have also been removed. The area of Indian-grown soft cane has been reduced from 35 acres in December, 1923, to 15 or 20 acres in May, 1927.

Wood (E. J. F.). **Fiji disease in the Maryborough district.**—*Queensland Agric. Journ.*, xxvii, 5, pp. 388–393, 4 figs., 1 map, 1927.

The localities in the Maryborough district of Queensland in which Fiji disease of sugar-cane [*Northiella sacchari*] is known or suspected to exist are defined [*R.A.M.*, vi, p. 186]. Under existing legislation heavy penalties will be incurred by any one exchanging, buying, or selling plants from farms in the infected area without the written permission of an inspector. Inspectors are authorized to order the destruction of diseased canes if necessary. The cane leafhopper (*Perkinsiella sacchari*) is thought to be implicated as a vector of Fiji disease. Instances are cited showing the extreme rapidity with which the disease spreads among ratoon crops. Growers are urged to take every precaution against the spread of this very formidable disease by the immediate notification of local outbreaks; monthly roguing of fields containing under 5 per cent. infection; use of clean seed from the Pialba district; and cultivation of resistant varieties, e. g. Q. 813, H. Q. 285, and Petite Senneville.

Wood (E. J. F.). **Bureau of Sugar Experiment Stations. Assistant Pathologist's Report.**—*Queensland Agric. Journ.*, xxvii, 5, pp. 395–396, 1927.

The two chief diseases of sugar-cane in the Isis district of Queensland are stated in this report (dated 26th April, 1927) to be mosaic and gumming [*Bacterium vascularum*]. The incidence of the former disease has been very greatly reduced, even on susceptible varieties like the Black Innis (M. 147), by careful seed selection and frequent roguing, but over 50 per cent. of infection was observed in one case to have spread from wild sorghum on public land to selected canes. In addition to M. 147, the Striped Singapore, Rappoe, and Rappoe Seedling varieties are susceptible to mosaic and their cultivation is not recommended; they might be replaced by Q. 813 and Q. 1098 on the lower lands of Dallarnil, and by E. K. 28 and Q. 1098 on the upper. H. Q. 285 also appears to do well as an early maturing cane in this area. The practice of using maize

in rotation with sugar-cane should be discontinued on account of the susceptibility of the former to mosaic and for other reasons.

Gumming disease was little in evidence at the time of writing. The susceptible D. 1135 variety is being gradually replaced by Q. 813. Knife cut [*R.A.M.*, v, p. 697] is present to some extent in the M. 1900 Seedling and D. 1135 varieties. Peg leg or foot rot [ibid., v, p. 632] occurs in a destructive form on M. 1900. This disease is stated to be frequently amenable to control by applications of lime and by good tillage.

Iliau disease (*Melanconium* [*Gnomonia*] *iliau*) is of widespread occurrence in a number of districts. The spores of the causal organism are destroyed by exposure to the sun, and the disease may therefore be controlled to some extent by good and frequent tilling before planting.

M. 1900 was affected on one farm at South Isis by a peculiar disease, in which the stalks of the stand-over cane are long and spindly, while the rind is striped red and white and the leaves are covered with short, yellow stripes resembling, but distinct from, mosaic.

PETCH (T.). **Revisions of Ceylon fungi. Part VIII.**—*Ann. Roy. Bot. Gard., Peradeniya*, x, 2, pp. 161–180, 1927.

This paper, a continuance of the author's series of critical notes on Ceylon fungi [*R.A.M.*, iv, p. 315] deals with 47 species of various genera.

The fungus described by Berkeley and Broome as *Helminthosporium arecae* forms on the leaves of *Areca catechu* black, superficial stromata, up to 0·6 mm. in diameter, from which hyphae radiate over the surface in a network about 0·2 mm. wide. The repent hyphae are irregularly contorted and often united laterally into broad strands. The stroma is densely covered with erect, dark brown, rigid, thick-walled conidiophores, up to 200 μ high, and ranging from 6 μ at the base to 12 μ at the apex. The conidia are obclavate, broadly flask-shaped, or broadly oval with an attenuated apex, the first type measuring 46 by 14 μ, the second 48 by 20 μ, and the third 32 to 42 by 20 to 26 μ. The spores are three- to four-septate, truncate at the base, the lowest cell but one often being darker than the others. This species closely resembles *Exosporium megalosporum* Penz. and Sacc., but the spores of the latter are stated to be larger. It is renamed *E. arecae* (B. and Br.).

GUILLIERMOND (A.). **Cytologie et sexualité du Spermophthora gossypii.**—[Cytology and sexuality of *Spermophthora gossypii*.]—*Comptes rendus Acad. des Sciences*, clxxxiv, 20, pp. 1189–1192, 1 fig., 1927.

The cytological examination of a culture of *Spermophthora gossypii* (supplied to the author by Ashby) confirmed Ashby's and Nowell's description [*R.A.M.*, v, p. 389] of its life cycle, which is of much phylogenetic interest. The uninuclear spores contained in the primary sporangia germinate immediately on their liberation; they swell and unite two by two by means of short lateral beaks. The walls separating the two beaks are resorbed, thus forming a canal uniting the two spores, in which the nuclei from the two spores

usually fuse together; occasionally the nuclear fusion takes place in one of the spores. A germ-tube is then formed either on the canal uniting the two spores or from the spore in which the fusion occurred, into which the sexual nucleus passes; this tube always remains short and may end in a terminal swelling which is cut off by a basal septum. The nucleus in the cell thus formed undergoes three divisions and the cell is transformed into an ascus with eight rod-shaped ascospores. Frequently, however, the germ-tube branches and forms an ascus at the end of each branch. Occasionally the primary spores germinate singly either directly or after an unsuccessful attempt at fusion.

Thus, *S. gossypii* gives rise to two types of spore sacs; the one representing a gametangium containing numerous gametes which fuse before germinating; while the other, arising from a short mycelium produced by the sexual spore, may be considered as a sporophyte and assimilated to an ascus.

The author considers the fungus as an archaic Ascomycete standing close to the Hemiascaceae, and a connecting link with the Siphomycetes [Phycomycetes]. From certain aspects it may be connected with the genera *Protomyces* and *Taphridium*, which differ from it by a septate thallus and the lack of a sporophyte, and resemble it by their sporangia. In its continuous mycelium and fusiform spores *S. gossypii* resembles the genus *Eremothecium*.

BERTUS (L. S.). **Grey blight of Tea and Coconut—a comparative study.**—*Ann. Roy. Bot. Gard., Peradeniya*, x, 2, pp. 197–241, 6 pl., 1927.

The writer's continued comparative studies of the grey blights of tea and coco-nut (*Pestalozzia theae* and *P. palmarum*) [*R.A.M.*, ii, p. 527] are fully described.

Both species produced saltants in culture. The spores of the variant strain of *P. theae* showed a peculiar swelling at the juncture where the cilia originate, and one to three of the three to six cilia were branched. On sterilized coco-nut leaf the spores measured 25 to 35 by 7 to 10 μ and the cilia up to 40 μ in length; on sterilized tea leaf the dimensions were 28 to 42 by 7 to 9 μ for the spores and up to 30 μ for the cilia. No pedicels were present in either medium. This strain differs from the type form of *P. theae* in its scanty mycelial growth, and in the absence of spore formation on free hyphae; in the latter character it resembles *P. palmarum*.

The saltant of *P. palmarum* differs from the type form of that species in the formation of fluffy aerial hyphae, the production of spores on free hyphae, the length of the cilia (up to 40 μ), and the absence of knobs on the latter. The spores of the saltant averaged 20·7 by 6·4 μ. Pedicels, varying in length from 3 to 10 μ, were always present in culture.

Twelve out of 15 inoculations made on wounded tea leaves with *P. theae* were successful, while 47 on unwounded leaves and six on the petioles gave negative results. Six inoculations with *P. theae* on wounded coco-nut leaves were successful and 24 on uninjured leaves unsuccessful. Fourteen inoculations with *P. palmarum* on wounded coco-nut leaves gave positive results, while 26 on uninjured surfaces were failures. *P. palmarum* did not cause infection

either on 32 wounded or 10 unwounded tea leaves. It is apparent from these results that *P. theae* is a wound parasite of tea and coco-nut, while *P. palmarum* can attack injured coco-nut leaves but not those of tea. Neither species can infect healthy leaves [cf. ibid., v, p. 391].

FROMME (F. D.), WINGARD (S. A.), & PRIODE (C. N.). **Ringspot of Tobacco: an infectious disease of unknown cause.**—*Phytopath.*, xvii, 5, pp. 321–328, 6 figs., 1927.

Ring spot or hieroglyphics of tobacco [*R.A.M.*, iv, p. 572] is stated to be widespread in Virginia, where it has probably been present for a number of years without attracting particular notice. The incidence of infection is usually low, but cases are on record in which appreciable loss has been caused. Severely infected plants may be dwarfed, with small leaves of low weight and inferior quality, while in other instances these symptoms are inconspicuous.

The spots, which occur only on the leaves, may be uniformly distributed and very numerous, or few and localized. They are circular or irregular according to their position between or on the veins. In the latter case infection follows the vein and its branches, and the outline of the lesion often suggests that of a deeply lobed leaf. The spots are bounded by definite broken lines of necrotic tissue, of a blanched or brown colour, which form single or double rings, about 5 to 8 mm. in diameter, in the circular lesions. The leaf tissue bordering the spots may be chlorotic, and it sometimes forms a distinct halo. No organism has been consistently isolated from tobacco leaves affected by ring spot, and none of those obtained proved pathogenic. Inoculum of crushed infected leaves, however, has repeatedly produced infection, which also occurred in subsequent transfers (up to four in succession). The incubation period varied considerably (from 4 to 14 days) in different greenhouse trials covering a wide range of environmental conditions. The spots develop best on young and growing leaves, little or no infection occurring on mature foliage. Young seedlings contracted infection, and in one case the disease was observed in the plant-bed. Infection was secured on *Nicotiana glutinosa*, *N. langsdorffii*, *N. paniculata*, *N. sylvestris*, and *N. tabacum*, and on a number of varieties of the last-named. The agricultural varieties, Burley, Green's Wildfire-resistant, Little Orinoco, Macedonia, and Maryland proved susceptible.

A localized rather than a systemic infection is suggested by the restriction of the spots to the parts of the leaf on which the inoculum is applied. There is evidence, however, that infection may become systemic later in the young shoots. In some cases all the new leaves produced above the point of inoculation have been infected.

Ring spot is often but not uniformly associated with mosaic in the field, and the two diseases evidently have similar potentialities. Mosaic is more infectious than ring spot and may easily spread throughout the field by harvest, whilst ring spot is often restricted to a few plants. Similar differences in behaviour occur in the greenhouse. The same plant may bear both diseases, and inoculum from such individuals usually produced both of them.

Present knowledge of ring spot indicates that it belongs to the

virus group of diseases. Johnson produced a type of ring spot in tobacco, possibly identical with that occurring in nature, by inoculation with the juice of apparently healthy potatoes [ibid., v, p. 119]. The writers failed to secure these symptoms by the same means.

TRIEBELS (H.). **Die Bekämpfung der Braunfleckenkrankheit bei Tomaten.** [The control of leaf mould of Tomatoes.]—*Gartenwelt*, xxxi, 18, pp. 268–270, 1927.

Serious damage was caused in the Crefeld district [Rhine Province] during 1926 by leaf mould of tomatoes (*Cladosporium fulvum*) [*R.A.M.*, v, p. 9]. Excellent control was obtained by the application, in the incipient stage of the disease and two to three weeks later, of 0·5 per cent. uspulun. After a further interval of two to three weeks the plants should be sprayed with 1 per cent. solbar to obviate the unpleasant flavour imparted by uspulun at this stage. Proper ventilation of the greenhouses is most important and the plants should receive plenty of light and warmth. On no account must the soil be allowed to become saturated, and subterranean irrigation, as practised in Holland, should be adopted if possible.

YOUNITZKY (A. A.). Зараженность лесов Мариобласти грибными заболеваниями, разрушающими здоровую и горелую древесину и вред от них для появившихся молодняков на гарях и короедниках по обследованиям Марийской экспедиции в **1926** г. [Fungi attacking healthy and scorched trees in the forests of the Mari Region, and the damage they cause to young stands arising on areas devastated by fire or bark insects, according to the observations of the 1926 expedition.]—Reprinted from *Изв. Казанск. Инст. С.-Хоз. и Лесоводства.* [*Kazan Inst. of Agric. and Silvicult. News*], iii, 1, 21 pp., 1927. [English summary.]

This report gives brief descriptions of the principal fungi that attack the trees in the forests of the Mari Region [central Russia]. On the pine (*Pinus sylvestris*) the most important disease, from an economic point of view, is the trunk rot caused by *Trametes pini* which, conservatively estimated, renders over 30 per cent. of the mature trees of grades I and II (according to Kraft's gradation) unserviceable for industrial purposes. Next comes blister rust (*Peridermium pini* f. *corticola*) with an average incidence of 7 to 8 per cent. (sometimes up to 22 per cent.), the propagation of which is greatly favoured by the abundance in the forests of its secondary host *Vincetoxicum officinale*; it is believed, however, that the disease may spread from tree to tree by means of aecidiospores, as relatively high percentages of infection were observed in areas from which the secondary host is totally absent. Spruce (*Picea excelsa*) and fir (*Abies sibirica*) are heavily attacked by *Polyporus* [*Fomes*] *annosus*; it is estimated that about 50 per cent. of the older trees of both species are rendered unfit for use by this rot, which extends to 7 or 8 m. from the ground into the boles, and predisposes the trees to the attacks of bark-boring insects. The spruce is further frequently attacked by the rust *Melampsorella caryophyllacearum*, which causes the formation of witches' brooms; its secondary hosts, *Stellaria holostea* and *Lychnis flos-cuculi*, are abundant everywhere

in the forests. Very heavy also is the attack of the fir cones by the rust *Pucciniastrum padi*, which greatly reduces the germinability of the seeds.

A list is given of saprophytic fungi which destroy the wood of coniferous trees blown down by the wind or killed by fire. The natural rejuvenation of the coniferous forests in areas devastated by the extensive fire which occurred in 1921 is greatly imperilled by the presence of *Melampsora pinitorqua* in plots where there is a strong admixture of the aspen (*Populus tremula*), the leaves of which were observed to bear numerous sori of the fungus, and of *Lophodermium pinastri*, the incidence of which on seedlings in some localities was found to be almost 100 per cent. Another danger to the young stands is presented by the almost universal infection of the soil with *Armillaria mellea* and *Fomes annosus*.

The fungi which injure broad-leaved species are also very briefly discussed.

WILSON (M.) & WALDIE (J. S. L.). **An Oak leaf disease caused by Sclerotinia candolleana (Lév.) Fuckel.**—*Ann. of Appl. Biol.*, xiv, 2, pp. 193–196, 1 pl., 1927.

The oak leaf disease caused by *Sclerotinia candolleana* has been found mostly on *Quercus pedunculata* and *Q. sessiliflora*, but nursery plants of *Q. rubra* have also been seen attacked, and several authors have recorded it on *Q. robur* and *Castanea sativa*. The symptoms and control measures have already been described [*R.A.M.*, vi, p. 62]. The first signs of the disease are usually noticed towards the end of June, and the ascospores are mature on the fallen leaves about a year after their infection. Details of the structure of the perfect stage are given.

The parasitism of this fungus was proved by successful inoculation of living leaves with ascospores from mature apothecia. Cultures made directly from diseased leaves and also from ascospores were quite similar in appearance and both formed sclerotia, usually at the edge of the medium.

GARBOWSKI (L.). **Pojawienie się większej liczby otoczni mączniaka dębowego Microsphaera quercina (Schw.) Burr. w lasach w wojew. poznańskiem.** [The appearance of a large number of perithecia of the Oak mildew *Microsphaera quercina* (Schw.) Burr. in the forests of the province of Poznań.]—*Prace Wydz. Chorób Roślin Państw. Inst. Nauk.-Rolnicz. w Bydgoszczy* [*Trans. Phytopath. Sect. State Inst. of Agric. Science in Bydgoszcz*], 3, 7 pp., 1 pl., 1927.

The author reports the first appearance of perithecia of the oak mildew (*Microsphaera quercina*) on the leaves of *Quercus pedunculata* and *Q. sessilis* [*Q. robur*] in the south-west of the province of Poznań in Poland in 1926: he also believes this to be the first authentic record of the perithecia on *Q. robur*. In 1926 the weather was much cooler and more rainy than normal for the region in question, conditions which are generally considered unfavourable for the production of the oak mildew perithecia; as, however, these fructifications were found in relatively large numbers, the author is led to conclude that the formation of the perithecia, in the present

case, cannot be attributed to the influence of meteorological factors, but rather supports the theory which sees in this formation of the perfect stage the completion of the life-cycle of the fungus under European conditions.

WEIR (J. R.). **Butt rot in Diospyros virginiana caused by Polyporus spraguei.**—*Phytopath.*, xvii, 5, pp. 339–340, 1927.

For several years living trees of the American persimmon (*Diospyros virginiana*) have been attacked by a butt rot in southern Indiana. The disease, of which there is believed to be no previous record on this host, was first observed in old basal scars on isolated trees. In November 1918, a large tree was found blown down, and growing directly from the decayed heart wood of the splintered butt was a small, poorly developed fructification of *Polyporus spraguei*. The rotted portion showed the carbonaceous character and other features typical of *P. spraguei*, which is believed to be the cause of the decay. *P. spraguei* appears to be a fairly common wound fungus which has been reported as the cause of a butt rot of oak and chestnut [*R.A.M.*, iii, p. 70]. The fungus is not supposed to occur in Europe, but the form described by Bourdot and Galzin as *P. castaneae* (*Bull. Soc. Myc. France*, xli, p. 105, 1925) is stated to be indistinguishable in its gross characters from the American species, while the microscopic features of both fungi are practically identical, and the type of decay which they produce in oak is the same.

WILSON (M.). **Defoliation of the Douglas Fir.**—*Gard. Chron.*, lxxxi, 4506, pp. 323–324, 1927.

In this article the writer summarizes briefly the known information concerning the disease of Douglas firs caused by *Rhabdocline pseudotsugae* [*R.A.M.*, v, p. 637]. The disease was probably introduced from America into the south of Scotland in 1914, and since then has appeared in the south of England, possibly owing to infection from the Scottish centre. In Great Britain the green Douglas fir (*Pseudotsuga douglasii*) has not hitherto been attacked, the disease having been found only on the blue Douglas (*P. glauca*) and intermediate forms, though in America all are susceptible. The exact method of infection is as yet unknown. Only leaves of the current year are attacked, and these show signs of the disease about the end of June. Diseased leaves usually fall in July, about 14 months after infection. In the Scottish locality defoliation of the current year's leaves has occurred every year since 1921, so that the trees were completely defoliated by 1926 and many were dead. The remainder will almost certainly die this year. Observation has shown that this is the usual course of events, and death may occur even after three years. If infection is not constant each year, as has happened in a few cases, the trees may possibly recover, but this is unusual.

The disease appears to be more severe and more continuous in its action in this country than in the United States. The resistance of the green Douglas to infection is of economic importance owing to the greater value of the timber of the latter, but it is not certain that this apparent immunity will be retained. In Great Britain

the disease has not been found on seedlings, but in America it causes considerable damage in forest nurseries.

The Forestry Commission is taking steps to stamp out this serious disease. In the Hampshire locality the affected trees have been destroyed, and the neighbouring susceptible ones sprayed with Bordeaux mixture. In Scotland, where the numbers of diseased trees are much larger, arrangements are also being made for their complete destruction.

VIIème Partie. Maladies des Plantes. Végétaux et animaux nuisibles à l'agriculture. [Part VII. Diseases of plants. Vegetable and animal pests of agriculture.]—*Annuaire Intern. de Législ. Agric., XVème Année, 1925*, pp. 739–780, 1926.

This section of the international year-book of agricultural legislation comprises the various orders and other measures enacted against plant diseases and insect pests during 1925 in different countries.

Legislative and administrative measures. Austria.—*Internat. Bull. of Plant Protect.*, i, 4, p. 58, 1927.

An order of the Federal Ministry of Agriculture and Forestry, dated 27th January 1927, supersedes the Order of 9th August 1926, as regards the control of wart disease of potatoes (*Synchytrium endobioticum*), and enacts that the importation and transit of fresh potatoes from Denmark, Germany, France, Great Britain and Ireland, the Netherlands, Poland, Switzerland, and the Czecho-Slovakian Republic shall be subject to the control measures of the Federal Law of 28th July 1926 [*R.A.M.*, vi, p. 128].

Legislative and administrative measures. Austria (Burgenland). —*Internat. Bull. of Plant Protect.*, i, 5, pp. 76–77, 1927.

Pursuant to the Austrian Federal Law of 28th July 1926, relating to the control of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, vi, p. 128, and preceding abstract], a similar order was promulgated by the Burgenland Diet on 4th December 1926, and published in the *Landesgesetzblatt für das Burgenland*, 24th March 1927. The person responsible for the first notification of an outbreak of wart disease within a 5 km. radius is entitled to a reward of 50 (Austrian) schillings. Infected or suspected potatoes may not be used for seed, and can only be employed for human or animal consumption after cooking and on the farm where grown. Fragments of diseased plants or parts thereof must be burnt or cooked before being used for fodder. Soil, liquid and farmyard manure, and compost must not be removed from an infected farm. Only wart-resistant varieties may be planted on fields declared to be infected and seed potatoes from these can only be used on areas declared infected.

Gold Coast Colony. Order by the Governor No. 44 of 1926. Under the Plants (Injurious Pests) Ordinance, 1923.—2 pp., 1926. [Received September, 1927.]

By an Order dated 30th November 1926, the kola plant [*Cola acuminata*] and the banana plant are placed in the category of 'declared plants' for the purposes of the Plants (Injurious Pests)

Ordinance, 1923 [an ordinance which provides for the prohibition of the importation of declared plants or their packings into the Gold Coast except under license from the Director of Agriculture.]

The following fungous parasites of cacao are hereby declared to be injurious pests for the purposes of the said ordinance [which provides for the declaration of any disease or pest of plants to be an injurious pest and for treatment of such diseases in any prescribed manner]. *Phytophthora faberi, Trachysphaera fructigena,* and *Botryodiplodia theobromae* on the pods [*R.A.M.*, vi, p. 19], *P. faberi, Armillaria mellea, Fomes lignosus, F. lamaoensis,* and *Ustulina zonata* on the stems and roots, and *Marasmius scandens* [ibid., iv, p. 68] and horsehair blight [*M.* sp.] on branches and leaves.

Territory of South West Africa. Agricultural Pests Ordinance, 1927.—*Official Gazette Extraordinary of South West Africa,* 237, pp. 3348–3353, 27th June, 1927.

An Ordinance, assented to on 13th June 1927, prohibits the introduction into the Territory of South-West Africa of insect pests and plant diseases. It provides for the registration and inspection of nurseries, for the quarantining of any nursery or part of it, when the presence of disease may necessitate this, and for the destruction of plants infected or exposed to infection. Compensation is to be paid in the latter case only. The Ordinance also specifies the restrictions under which plants may be introduced into South-West Africa, written permits from the Department of Agriculture being required for all plants used for propagation. The following may not be introduced from overseas without inspection at the port of entry: grape vines and other plants of the family Vitaceae; sugar-canes; plants cultivated for the production of rubber; tea plants; cotton seeds; seeds, fruits, and cuttings of the genus *Olea*; date palms; potato seed, tubers, or cuttings, or any plant of the genus *Solanum*. All other plants are also liable to inspection. Diseased plants, together with their packing material, may be destroyed or treated at the expense of the importer, as the Administrator shall decide. Plants imported from the Union of South Africa must be accompanied by a certificate from an authorized officer of the Agricultural Department of the Union, stating the place of origin of the consignment, and certifying its freedom from disease. Officers may also be empowered to inspect any premises other than nurseries, and quarantine the whole or part, or adopt any other precautions. Compensation is to be made for loss so incurred.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

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HESSELINK (E.). **Onder welke omstandigheden doet Lophodermium pinastri Chev. te Appelscha, Exloo en Odoorn schade in Dennenbeplantingen?** [Under what conditions does *Lophodermium pinastri* cause damage in Pine plantations at Appelscha, Exloo, and Odoorn?]—*Tijdschr. over Plantenziekten*, xxxiii, 5, pp. 105–124, 3 graphs, 1927.

Leaf fall of pines (*Lophodermium pinastri*), which has caused much damage in northern Holland during the last fifteen years, has been observed to be very dependent on meteorological conditions [*R.A.M.*, vi, p. 452]. Epidemics of the disease occur in seasons following very dry spells in February, March, and April; after winters with a heavy rainfall; and subsequent to very dry summers. In most cases the trees attacked by *L. pinastri* are already weakened by metabolic disturbances associated with these unfavourable conditions. It was observed at Appelscha that the pines reach a critical stage in their development five years after planting, following which period they become susceptible to leaf fall, generally until they are about twenty years old. The presence of large quantities of stagnant water in impermeable soils is another important contributory factor in the occurrence of leaf fall.

The irregular incidence of *L. pinastri* is very striking. The disease is much more prevalent in the north than in the south of Holland, but even in the former area some plantations on suitable soil remain healthy in the immediate vicinity of infection centres. The climatic conditions determining the development of leaf fall are not always uniform in different countries. The disease was extremely prevalent in 1923 in Germany, Holland, and Norway [loc. cit.], the critical year for the initiation of the epidemic being particularly cold in the last-named country and unusually dry in Holland.

Control measures should be based on an improvement in the condition of the pine roots by general soil sanitation.

VAN LUIJK (A.). **Brunchorstia destruens Erikss. auf Pinus laricio var. corsicana und ihre Reinkultur.** [*Brunchorstia destruens* Erikss. on *Pinus laricio* var. *corsicana* and its pure culture.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten', Baarn (Holland)*, xi, pp. 52–57, 5 figs., 1927.

Pinus laricio var. *corsicana* trees in a plantation at Frederiksoord (Holland) were affected in 1926 by a die-back of the branches due to *Brunchorstia destruens* (*Cenangium abietis*) [*R.A.M.*, vi, p. 196]. The needles showed the typical rusty brown discoloration proceeding from the base upwards. The terminal buds soon died, confirming the general view that infection originates at this point and subsequently penetrates the needles and branches. The symptoms of the disease observed in Holland are stated to correspond with those first described by a Brunchorst from Norway, and the fungus isolated from infected material also agreed in all respects in *B. destruens*. Several other fungi, of which *Zythia pinastri* was the most conspicuous, occurred in association with the causal organism of the die-back.

B. destruens made scanty growth on synthetic media, forming fairly dense, brownish-green to brownish-black stromatic tissue in the agar and a yellowish or green, velvety mycelium on the surface. On maize meal the colour of the vegetative growth was particularly vivid, ranging from yellowish-green to greenish-black. Pycnidia were formed on sterilized conifer branches and on lupin, tomato, and potato stalks. The best development was obtained on a mixture of cherry decoction and dung agar. The pycnidia developing in culture are uni- or pluriloculate, being sometimes formed in large, compact stromata with numerous loculi. The yellowish to dirty pink, fusiform, curved, septate conidia emerge from circular or irregular ostioles. The writer also found in the same loculi as the ordinary conidia, other bacilliform, straight or slightly curved microconidia, 4 to 5 by 1·25 to 1·75 μ, borne laterally or terminally on more or less profusely branched conidiophores. This is believed to be the first record of the occurrence of this type of fructification in *B. destruens*.

LIERNUR (A. G. M.). **Hexenbesen: ihre Morphologie, Anatomie und Entstehung.** [Witches' brooms: their morphology, anatomy, and origin.]—Thesis, University of Utrecht (Nijgh & Van Ditmar, Rotterdam), 57 pp., 1 pl., 31 figs., 1927.

In this paper the author reviews the literature on parasitic and non-parasitic witches' brooms, and describes the morphology and histology of some new cases of the latter group affecting magnolia, *Crataegus*, elm, horse-chestnut (*Aesculus hippocastanum*), *Calluna*, pear, pine, and beech. The phenomenon is attributed, in the case of magnolia, to pruning, and in that of beech to the attacks of *Cryptococcus fagi*. In the latter host the occurrence of witches' brooms appears to be on the increase. Notes are also given on the witches' brooms of sour cherries, due to *Exoascus* [*Taphrina*] *cerasi*, and of birches, believed to be caused by mites. Bacteria were isolated from the malformations on horse-chestnuts and elms, but inoculation experiments with these organisms, as well as with *Bacillus* [*Bacterium*] *tumefaciens*, gave negative results.

HUNT (G. M.). **Notes on wood preservation and utilization in Europe.**—*Proc. Amer. Wood Preservers' Assoc., 1927,* pp. 107–151, 39 figs., 1927.

In this paper the author gives a comprehensive survey of his visit to Europe in 1926, made for the purpose of studying the various methods of timber preservation practised in different countries.

Coal-tar creosote is everywhere regarded as the most effective preservative. Zinc chloride mixed with creosote and peat tar is used on the Italian State Railways. Corrosive sublimate in a solution of about two-thirds of one per cent. is largely used in Holland, Germany, Italy, France, and elsewhere. Copper sulphate has not been employed for telegraph poles by the German Postal Administration since 1910, but it is still used in France, Denmark, and Switzerland. The poles thus treated show good records for durability. The so-called Wolman salts, represented by triolith, are extensively and successfully used in German mines, while basilite has given excellent results in Germany, Hungary, and Czecho-Slovakia, and has been used on the Dutch railways, and malenite (a similar product) is sold by a Viennese firm for mine timber treatment [*R.A.M.*, iv, pp. 388, 454]. Aczol, a Belgian preservative consisting of copper and zinc salts and phenol in ammoniacal solution, is reported to be widely used in Poland and Rumania [ibid., vi, p. 136]. Viczsal (probably identical with aczol) was found to render treated sleepers brittle in Italy.

The principal kinds of timber treated and the treating processes are enumerated and briefly described. The Furnos process, developed in Sweden for the treatment of standing poles, consists in digging away the earth for a depth of one or two feet, scraping away decayed wood, charring the pole surface with a blow-torch, and spraying it with creosote. This extensively used process should be renewed every five years. A similar method of treatment has been used for several years by the Western Union Telegraph Company in the United States.

Notes are also given on various other aspects of wood preservation, including treating apparatus, adzing, boring, and sleeper plating machines, sleeper and pole forms and sizes, mine timbers, seasoning, and the like.

BATEMAN (E.) & BAECHLER (R.). **Theory of the mechanism of protection of wood by preservatives. Part VII: Some experiments on the toxicity of inorganic salts.**—*Proc. Amer. Wood Preservers' Assoc., 1927,* pp. 41–48, 1927.

The writers carried out a series of tests on the toxicity to *Fomes annosus* of a number of inorganic salts, by growing the fungus on a nutrient agar medium in which the toxic material had been dissolved. The results obtained indicate that the order of toxicity of the various metals or radicles is as follows: mercury, nickel, silver, lead, copper, chromates, cadmium, iron, cobalt, zinc, fluorides, and manganese. Taking into consideration the cost of the materials and the fact that some attack steel, only sodium chromate, iron sulphate, borax, sodium fluoride, and zinc chloride are considered to be of much practical importance, and of these sodium chromate

(0·06 to 0·08 per cent.) and borax (0·25 per cent.) appear to be especially promising.

LONG (W. H.). **When is rot not rot? Progress report.**—*Proc. Amer. Wood Preservers' Assoc., 1927*, pp. 70–77, 1927.

In this paper the writer summarizes the results of further experiments on the effect of certain pressure treatments on heart rots in railway sleepers at Albuquerque, New Mexico [*R.A.M.*, v, p. 399]. Engelmann spruce [*Picea engelmanni*], loblolly pine [*Pinus taeda*], Douglas fir [*Pseudotsuga taxifolia*], and cork-bark fir [*Abies arizonica*] were found to be completely sterilized by the customary zinc chloride, creosote, and petroleum oil treatments, but yellow pine [*P. ponderosa*] floaters infected by *Polyporus ellisianus* and *P. schweinitzii* were not amenable to these methods, probably on account of the water absorbed during their four to six weeks on the river.

MACLEAN (J. D.). **Relation of treating variables to the penetration and absorption of preservatives into wood. Part III. Effect of temperature and pressure on the penetration and absorption of coal tar creosote into wood.**—*Proc. Amer. Wood Preservers' Assoc., 1927*, pp. 52–70, 8 graphs, 1927.

The results of a series of tests [details of which are given] on the relation of treating pressure, temperature, and viscosity to the penetration and absorption of coal-tar creosote into eastern hemlock [*Tsuga canadensis*] sleepers showed that the absolute viscosity of the creosote was the most important factor studied. Increasing the preservative temperature not only augmented the penetration and absorption at each pressure used, but also made increases in pressure much more effective. For the range of temperatures and pressures used the relation of temperature, pressure, and penetration can be expressed by an empirical equation. Temperature was found to be of minor importance in comparison with viscosity.

BATEMAN (E.). **Factors governing the permanence of preservatives.**—*Proc. Amer. Wood Preservers' Assoc., 1927*, pp. 87–98, 1 fig., 1927.

This is a theoretical discussion on the factors governing the permanency of timber preservatives, a question of prime importance in wood preservation but one of complex nature involving many factors, such as variation in the density of the different woods, conditions governing the flow of liquids into and out of the wood, evaporation, and loss due to leaching where the wood is in contact with the soil. From preliminary work, the author concludes that permanency is bound up inseparably with the movement of water through wood.

MAIRE (R.). **Algeria: plant diseases observed in March, 1927.**—*Internat. Bull. of Plant Protect.*, i, 4, pp. 51–52, 1927.

Following the cold, rainy winter of 1926–7, *Sclerotinia sclerotiorum* (not previously reported from North Africa) caused some

damage in potato crops near Algiers. This fungus also attacked the roots of white lupins (*Lupinus albus*) in the same district.

Two-year-old artichokes (*Cynara scolymus*) were somewhat severely damaged in the Mitidja plains near Algiers by a disease involving stunting of the shoots and an appearance of the foliage resembling 'frisolée' of the potato. No visible parasite could be detected. Subsequently the involucre bracts on the flower heads, which are scanty and very sensitive to adverse meteorological conditions, were attacked by a hitherto undescribed species of *Diplodina* which is named *D. cynarae* but without diagnosis. It induces blackening and mouldiness of the affected parts.

COONS (G. H.) & STEWART (D.). **Prevention of seedling diseases of Sugar Beets.**—*Phytopath.*, xvii, 5, pp. 259–296, 9 figs., 1927.

Full particulars are given of a series of laboratory, greenhouse, and field tests carried out in Michigan to investigate the possibilities of controlling seedling diseases of sugar beets associated with *Phoma betae*, *Pythium de Baryanum* and other Phycomycetes, and *Rhizoctonia* spp., which cause serious losses (up to 25 per cent. of the crop) in many sections of the State.

The seedling diseases under investigation fell into three general types. The first is marked by a brown and black discoloration of the hypocotyl and root, usually showing above soil-level before the plant collapses. The second is characterized by rapid wilting and by a brown decayed region in the root, with discoloration of the central vascular system. The external lesions present a water-soaked aspect contrasting strongly with the dry, black appearance of those produced by the foregoing type. Complete decay is usually effected in 24 hours after the first sign of wilting. In the third and least distinctive form of seedling disease, the leaves are of an unusually deep or bluish green, and the stems are often lemon-yellow. Slow growth and other evidences of malnutrition are found. The tips of the tap roots are decayed and adventitious rootlets develop above the rotted region. Such plants may produce marketable beets, but of an inferior grade. Generally speaking, *P. betae* is chiefly associated with the first type of seedling disease, *Pythium* spp. with the second, and *Rhizoctonia* spp. with the third. An extremely common form of injury, which is often overlooked, is the rotting or damping-off of the seedling immediately on emergence from the seed ball. *Pythium* spp., and probably also *Phoma betae*, are associated with this type of infection, which is very prevalent on wet soils.

Seed grown from carefully selected roots was found to be extensively infected with *P. betae*, confirming previous reports regarding the almost universal occurrence of this organism in commercial beet stocks.

Greenhouse tests in muck and sandy loam soil [the results of which are tabulated] showed an immense reduction of germination due to the beet pathogens, the losses thus incurred increasing with the repeated use of the same soil. *Pythium de Baryanum* was most commonly associated with diseased seedlings on muck soil, and was also widely present in sandy loam. *Phoma betae* and

Rhizoctonia sp. were also isolated. Tests with seedlings grown in sand showed that damping-off, chiefly caused by *P. betae*, may be responsible for the destruction of 33 per cent. of the seedlings appearing above soil-level.

Inoculation experiments showed that *Phoma betae* and *Pythium de Baryanum* are both very strong and rapidly working parasites, while *Rhizoctonia* sp. causes a high incidence of infection but acts more slowly and often produces only partial symptoms. Seed treatment was ineffectual in cases of widespread soil infestation. The fungus content of the substratum and of the seed ball, rather than the physical structure of the soil, appeared from the writers' observations to be the decisive factors in the causation of disease.

Formaldehyde, furfural, nickel carbonate dust, kalimat, tillantin B, and seed-o-san were practically useless in seed treatment for the control of these diseases, whilst pasteurization, dry heat treatment, and selection of large seed also proved ineffectual. The mercury and copper compounds, however, consistently reduced infection arising from the seed, and further exercised a protective action against that from the soil. Semesan and Dupont semesan 13 dusts, used in excess, were the leading treatments in the greenhouse trials, while chlorophol and uspulun (both at the rate of 1 in 400) and mercuric chloride (1 in 1,000) greatly reduced the percentage of disease and gave stands far superior to those from untreated seed. Fairly good results were further given by copper carbonate (18 per cent.) and copper sulphate and lime (50–50) dusts. The field results, though somewhat inconclusive, generally tended to confirm those obtained in the greenhouse.

Liquid treatments are regarded as impracticable for commercial use on account of the difficulties connected with drying large quantities of seed, while the mercury compounds are prohibitive in cost. It might be possible, however, to combine the relatively efficient copper dusts with mercurial substances in such a way as to obtain an economical disinfectant adapted to commercial use.

ESMARCH [F.]. **Eine gefährliche Spargelkrankheit.** [A serious Asparagus disease.]—*Zeitschr. für Obst-, Wein- und Gartenbau*, liii, 5, pp. 65–66, 1927.

An asparagus disease submitted in the summer of 1926 to the head office for plant protection in Dresden, was identified as being due to *Rhizoctonia violacea* [*R. crocorum*] [*R.A.M.*, v, p. 208]. Asparagus cultivators are advised, when this disease appears, not merely to free the beds from all diseased roots, but, since the mycelium can survive for years in the soil, to treat the latter with a 1 per cent. solution of formaldehyde in the proportion of about 5 l. to 1 sq. m. Preventive measures should include rotation, thorough weeding and drainage, and autumn liming.

RIVES (L.). **Recherches sur quelques formes de dépérissements de la Vigne.** [Researches on certain forms of Vine decay.]—103 pp., 14 figs., Toulouse, Imprimerie Régionale, 1926.

This pamphlet, based on a thesis for the doctorate of science in Toulouse University, gives the results of the author's researches on various types of vine decay, some of parasitic origin and others in

which no parasite has been found. Of these the most important are the esca disease attributed to the wound parasite *Stereum hirsutum*, and court noué, a physiological trouble associated according to the author with an undue development of the endotrophic mycorrhizal fungus resulting from the effects of waterlogging and insufficient aeration on the roots of the vine [*R.A.M.*, iii, p. 501].

The fungus found by the author associated with the esca disease is stated to be indistinguishable from *S. hirsutum* Willd., and he has not observed any reason for separating it as a distinct species, *S. necator*, as proposed by Viala [ibid., v, p. 592]. The microscopic characters of this fungus and its effects on the tissues are described in some detail. The disease is more prevalent on grafted vines than on those on their own roots, and is favoured by want of affinity between the stock and scion, severe pruning, and poor root development from any cause.

Another type of decay, observed especially on grafted hybrids, is associated with the production of tyloses in the vessels of the graft. It is attributed to lack of transpiration water reaching the graft, and may be due to various causes such as unsuitable soil conditions for the stock, want of affinity between the stock and scion, and inadequate union between the two. In certain associated cases of poor root development endotrophic mycorrhiza are excessively developed and become injurious.

RAVAZ (L.). **Le black rot.**—*Prog. Agric. et Vitic.*, lxxxvii, 22, pp. 525–528, 1 col. pl., 1927.

After describing in popular terms the symptoms and progress of black rot on vines [*Guignardia bidwellii*], the author states that this disease is generally due to infection from fallen grapes, or, less commonly, from cankers at the base of the vine shoots. In either case, a prolonged period of rain is necessary to initiate an attack. It is said that the vine can be affected as soon as the young shoots show two or three leaves. During the summer, treatment with Bordeaux mixture is recommended, together with dusting of the bunches with copper talc. The first few treatments must be given at brief intervals, especially if the weather is rainy, and should be directed particularly to protect the young leaves and fruit clusters.

ZILLIG (H.) & NIEMEYER (L.). **Der rote Brenner (Pseudopeziza tracheiphila Müller-Thurgau) der Reben.** [The 'roter brenner' (*Pseudopeziza tracheiphila* Müller-Thurgau) of the Vine.] —*Biol. Reichsanst. für Land- und Forstwirtsch., Flugbl.* 87, 4 pp., 1 fig., 1927.

This is a popular description of the 'roter brenner' disease of the vine caused by *Pseudopeziza tracheiphila*, which is particularly severe in Germany on the Elbling (Kleinburger) and Blauer Burgunder varieties [cf. *R.A.M.*, iv, p. 461]. The disease, which is known to occur also in Austria, Hungary, Czecho-Slovakia, Russia, Switzerland, France, and Luxemburg, is probably responsible for much greater damage than is generally supposed. The fungus has been found to retain its viability for over two years in vine leaves, and is capable of growth at a range of –7° to 50° C., the optimum temperature being about 20°. Good control of the disease may be

effected by spraying with 1 to 1·5 per cent. nosperal or Bordeaux mixture, and by the ploughing under of infected foliage.

ZILLIG (H.). **Spritz- und Staubarbeiten im Weinberg.** [Spraying and dusting operations in the vineyard.]—*Biol. Reichsanst. für Land- und Forstwirtsch., Flugbl.* 88, 4 pp., 1 diag., 1927.

The requisite spraying and dusting operations for the control of insect pests and fungous diseases of the vine are summarized and presented in the form of a schedule. The author further recommends that during the dormant period (September to April) the ground should be deeply hoed, care being taken to bury the previous season's dead leaves which may harbour the spores of *Peronospora* [*Plasmopara viticola*] and roter brenner [*Pseudopeziza tracheiphila*: see preceding abstract].

Ueber Erfahrungen mit dem 'Horstschen Kupferstaubmittel'. [Results of trials with Horst copper dust.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvi, 10, pp. 157–163; 11, pp. 183–186; 12, pp. 203–205, 1927.

The results of vine dusting against *Peronospora* [*Plasmopara viticola*] in 1925 and 1926 with Horst copper dust at various stations in Switzerland are recorded and compared with the results of spraying with Bordeaux mixture. In most cases the dusted vines had first been treated with Bordeaux mixture. In general fairly good results were obtained when conditions were relatively unfavourable to the development of downy mildew, but in bad years this dust has so far proved ineffective. It does not reach all parts of the leaf, and is too easily washed off by rain. Thus, after a hail-storm in August, *Plasmopara* occurred on the dusted, but not on the sprayed vines. Scorching was fairly frequent on the dusted vines. In one test, no injury was visible after three dustings, but after the fourth and fifth, leaf scorching occurred. At Arenenberg in 1926, the Horst dust completely failed to control the disease. In trials conducted at Maienfeld in 1925 it was found that double the prescribed quantity of dust was necessary. The cost was approximately equal to that of spraying. As advantages over spraying are mentioned the shorter time required in dusting, its easier manipulation, and the lesser weight of material that it is necessary to handle. The dust is not recommended for general use at present, but further trials are required.

SCHELLENBERG (H.). **Zur Bekämpfung des falschen Meltaues.** [Control of downy mildew.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvi, 11, pp. 178–179, 1927.

Spraying the vines as soon as infection is detected with a 1 to 2 per cent., and again before flowering with a 2 per cent. Bordeaux mixture, is advocated as the best measure against downy mildew [*Plasmopara viticola*]. The mixture is most effective if the quantity of lime does not exceed one-half or at most two-thirds of the weight of copper sulphate employed. The writer does not favour dusting in place of spraying, but recognizes its value where rapidity of treatment is essential and when used to supplement spraying. He draws attention to the equal danger of scorching with dusts as

with sprays, which may be due to the fact that their composition, the Horst dust not excepted, is less uniform than that of the liquid fungicides.

LIBUTTI (D.). **Norme per combattere efficacemente la Peronospora della Vite.** [On the efficient means of control of Vine *Peronospora*.]—*L'Istria Agric.*, vii, 9, pp. 199–204, 1927.

The spring of 1927 was especially favourable to the development of vine mildew [*Plasmopara viticola*] in Italy, and the author gives a brief account of the disease and its control. He considers that dusting with Caffaro powder [*R.A.M.*, i, p. 66] gives as good results in the control of the disease as applications of Bordeaux mixture. After many years' experience it has been found advisable to use the latter at a strength not exceeding 1 per cent. and to avoid an excess of lime. While spraying is sufficient to preserve the foliage from attack, it is not always effective against mildew of the fruit bunches, for which dusting is superior. On this account a treatment by spraying in the early stages of the disease and dusting later on is recommended.

RAVAZ (L.). **Chronique: Traitement d'été de l'anthracnose.** [Current events: Control of anthracnose in summer.]—*Prog. Agric. et Vitic.*, lxxxvii, 20, pp. 477–479, 1927.

The author states that treatment for vine anthracnose [*Gloeosporium ampelophagum*: *R.A.M.*, vi, p. 459] during plant growth should be given with Bordeaux or Burgundy mixture, preferably with the former for the early applications. Anthracnose appears sooner than mildew [*Plasmopara viticola*], but the immunity enjoyed by French vines previously treated with copper sulphate mixtures is stated to show that measures taken to prevent mildew will also avert anthracnose. A case of this disease, in which, however, the cankers were not deep, has been noted upon a vine of the Noah variety, hitherto considered resistant to every malady.

PARKER (W. H.). **Reports on trials carried out by the Institute in 1924–25.**—*Journ. Nat. Inst. of Agric. Bot.*, 6, pp. 4–7, 22–38, 51–66, 1927.

Observations made in 1925 on autumn-sown wheats on the trial plots of the National Institute of Agricultural Botany showed that at Cambridge yellow rust [*Puccinia glumarum*] was very slight on Little Joss, Yeoman II, and The Fox wheats, and slight to moderate on the other varieties tested except Iron III, on which the attack was rather bad; at Norwich, the rust was most in evidence on Squarehead's Master, and mildew [*Erysiphe graminis*] was most common on Iron III, but neither was severe.

Helminthosporium avenae appeared on oats at all the trial centres of the Institute, and notes are given on the incidence and course of the disease on different varieties at each centre. Field observations showed that the primary phase of the disease is started by infection from the seed, while the secondary phase (leaf spot) may appear at any stage of development of the host as a result of infection by spores from the primarily diseased leaves, the green ears at their emergence being as liable to infection as the leaves.

Spring-sown barleys at Cambridge showed a slight amount of infection with *H. gramineum* and *H. teres* on all the varieties tested, except Sunrise. At Norwich all the varieties suffered heavily from attacks of *H. teres*, but Spratt Archer and Sunrise appeared to be less severely attacked than the remainder. At the Lord Wandsworth Agricultural College, *H. teres* was most severe on Beaven's 25, Beaven's Archer, and Plumage Archer.

A detailed report is given of the results of the first year's trials of maincrop varieties of potatoes carried out in 1925 at Ormskirk, Kirton, and Truro. Notes on the incidence of leaf roll, mosaic, streak, blackleg [*Bacillus atrosepticus*], and blight [*Phytophthora infestans*] indicate that in general the stocks were exceptionally healthy, but the Majestic, Golden Wonder, 49, and 333 varieties were inferior in one way or another to the remainder. Blight was very prevalent at Kirton and affected varieties to very different extents.

SZEMBEL (S. J.). Обзор болезней культурных и луговых растений Астраханской губ. в **1924** и **1925** г.г. [Synopsis of diseases of cultivated and pasture plants recorded in the Astrakhan region in 1924 and 1925.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, i, 5–6, pp. 44–58, 1927. [French summary.]

This is a list of the principal fungous diseases of cultivated plants and meadow grasses, arranged by their hosts, which were recorded in the region of Astrakhan, Russia, in 1924 and 1925. Severe outbreaks of vine mildew (*Plasmopara viticola*), wheat bunt (*Tilletia tritici*), and anthracnose of cucurbits (*Colletotrichum lagenarium*) occurred in 1925, probably owing to the weather experienced during that year, in which powdery mildew of the potato (*Oidium solani* Vanha) [? *Erysiphe cichoracearum*] was also observed in some localities.

SNOWDEN (J. D.). **Report of the Acting Mycologist for the period November 10th, 1925, to September 30th, 1926.**—*Ann. Rept. Uganda Dept. of Agric. for the year ended 31st December, 1926*, pp. 30–32, 1927.

The most important coffee disease in Uganda is stated to be that due to *Polyporus coffeae* in association with a mealy bug [*Pseudococcus lilacinus* (previously recorded as *P. citri*): *R.A.M.*, v, p. 16] on the roots of *Coffea robusta*.

Brown bast of rubber is prevalent on most estates which have been tapped over a number of years, and it has generally been found that the inability of the natives to delimit the exact area affected by the disease militates against the success of the Keuchenius treatment [ibid., iv, p. 310].

Experiments are stated to have shown that mouldy rot of the bark of *Hevea* rubber [ibid., vi, p. 372] is due to exposure of the wood when tapping, which allows a number of fungi, including species of *Fusarium*, *Cephalosporium*, and *Sphaeronema*, to gain an entry. The last-named is also said to have been found on *Caryota urens*.

Brown root rot (*Fomes lamaoensis*) was noted on tea, but leaf diseases of this crop were unimportant except in one case, where

Colletotrichum camelliae [*Glomerella cingulata*] was accompanied by red spider [? *Tetranychus bioculatus*].

A *Cephalosporium* similar to *C. sacchari* was found on sugar-cane, associated with a wilt caused by borers, but the fungus produced no serious injury. Brown leaf spot (*Cercospora longipes*) severely damaged young leaves of sugar-cane.

Cotton bolls were infected by a species of *Nematospora* considered by the author to be probably *N. gossypii* [ibid., v, p. 389]. Areolate mildew (*Ramularia areola*) is still prevalent on cotton leaves, while *Mycosphaerella gossypina* was observed in the conidial and perithecial stages, and an *Alternaria*, stated to be probably *A. longipedicellata* (Reichert) n. comb. [*Sporodesmium longipedicellatum*: ibid., iii, p. 324], was also frequently found on the leaves, but is thought by the author to follow other fungi. An undetermined species of *Alternaria* was also noted on cotton bolls, and *Nigrospora sphaerica* occurred on cotton seed, seedlings, and leaves. Investigations of a wilt of cotton seedlings showed bacteria to be always present, and resulted in the isolation of *Bacterium malvacearum* from some of the seedlings and from the interior of the seed. The most generally present fungi in the wilted plants were species of *Fusarium*, including *F. udum* [*F. vasinfectum*: ibid., v, p. 767]. These organisms are considered to be the chief causes of the wilt, but incapable of seriously injuring seedlings unless these have been weakened by unfavourable conditions.

Gibberella saubinetii was observed on wheat. Sorghum was damaged by a species of *Phoma*, thought to be probably *P. insidiosa*, and a *Cercospora*. *Eleusine coracana* was infected with a *Helminthosporium* (? *H. nodulosum*).

A mildew (*Oidium* sp.) on *Sesamum indicum* in the same plot where the sclerotia and pycnidia of *Macrophoma corchori* [*Macrophomina phaseoli*: see below, p. 757] were found is thought to have made the leaves more susceptible to attack by the latter. A *Colletotrichum* and, more frequently, a species of *Cercospora* were also found on sesame.

Bean rust (*Uromyces appendiculatus*) seriously damaged *Vigna* sp. ('Mpindi') and *Phaseolus radiatus* ('Mpokya'), and was sometimes accompanied by *Ascochyta phaseolorum*.

Rhizopus nigricans, *Penicillium* sp., and *Phytophthora* sp. caused rots of sweet potatoes, and the same fungi were associated with root rot of groundnuts.

HOPKINS (J. C. F.). **Report of the Mycologist for the year 1926.** —*Rept. of the Secretary, Dept. of Agric., Southern Rhodesia, for the year 1926*, p. 41, 1927.

The organisms responsible for wildfire and angular leaf spot of tobacco [*Bacterium tabacum* and *Bact. angulatum*] have been isolated and are being cultured for confirmation of the presence of these diseases in Southern Rhodesia. *Cercospora nicotianae*, *Phyllosticta nicotiana*, and *Macrosporium longipes* have been found in connexion with leaf spots of tobacco, while another species of *Macrosporium* and an unidentified fungus are suspected of causing infection of seedlings. A species of *Rhizoctonia*, probably *R. bataticola* [*Macrophomina phaseoli*: *R.A.M.*, vi, pp. 438, 439, and below,

p. 757], attacked tobacco roots, and produced similar symptoms to those of black root rot (*Thielavia basicola*).

Elsewhere in the report (p. 42) the occurrence of a case of Granville wilt of tobacco [*Bact. solanacearum*] is reported by Eyles.

The following are new records for Southern Rhodesia: *Tranzschelia punctata* [*Puccinia pruni-spinosae*] on apricot leaves; stem rot of papaw [*Carica papaya*], probably due to *Macrosporium* sp.; *Sclerotium rolfsii* on *Delphinium*; *Fusarium udum* [*F. vasinfectum*: ibid., v, p. 768] on pentstemon; bacterial blight of apple trees, probably due to *Bacillus amylovorus*; and *Glomerella psidii* (*G. rufomaculans*) on plums.

OGILVIE (L.). **Report of the Plant Pathologist for the year 1926.**—*Rept. Dept. of Agric., Bermuda, for the year 1926*, pp. 35–41, 1927.

The following are some of the chief references of phytopathological interest contained in this report.

The mosaic disease or group of diseases of the lily [*R.A.M.*, vi, p. 16] was found to take two or three seasons to produce marked symptoms in the plant, and to be peculiarly sensitive to changes of temperature, being most marked at low temperatures. The disease was present in all commercial varieties of *Lilium longiflorum*, and proved of much importance in the greenhouses. In the case of *Phytophthora* rot [loc. cit] occurring in the centres of the rosettes of lilies early in the growing season, conidia were produced on the leaf surfaces in great quantity during rainy weather.

Pink rot of celery, caused by *Sclerotinia sclerotiorum*, appears unimportant in Bermuda, but in May, 1926, the same fungus was found causing lesions accompanied by a bluish discoloration on *Helichrysum* stems.

In June, considerable loss was sustained on squashes, pumpkins, and melons through powdery mildew (*Erysiphe*) [*cichoracearum*]. On these the disease was almost omnipresent, becoming troublesome when conditions were unfavourable to vigorous growth. Downy mildew of cucurbits (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) was not found in 1926.

MILBRATH (D. G.). **Plant pathology.**—(*Seventh Rept. California Dept. of Agric. for the period ending 31st December, 1926*). *Monthly Bull. Dept. of Agric. California*, xv, 7–12, pp. 131–133, 1927.

The powdery mildew of cantaloupes [*Erysiphe cichoracearum*], which first developed to any perceptible degree in California in 1925, was far more destructive during the year under review. By 18th May it had attacked 35,000 acres of this crop in Imperial Valley. The best control method since evolved consists in placing commercial ground sulphur and flowers of sulphur on the soil under the plants.

Peach rust (*Puccinia pruni-spinosae*) occurred in many orchards in Sutter and Yuba countries, the Midsummer or Glandless varieties suffering most. Tomatoes were attacked by late blight (*Phyto-*

phthora infestans), and downy mildew (*Peronospora schleideni*) proved very destructive on onion seed crops. Of various substances tested for the control of the latter disease, copper-lime dust and Bordeaux mixture plus paper-hangers' paste gave the most promising results. *Fusarium vasinfectum tracheiphilum* [*F. tracheiphilum*] attacked Blackeye cowpeas, but the substitution of the small Lima bean [*Phaseolus lunatus*] resulted in a good crop. Four varieties of hybrid melons tested on soil infected with *F. niveum* were found highly resistant.

JACZEWSKI (A. A.). Бактериофаги в применении к фитопатологии. [Bacteriophages considered from a phytopathological point of view.]—Reprinted from *Материалы по Микол. и Фитопат. России.* [*Matters concerning Mycol. and Phytopath. in Russia*], v, 2, 12 pp., 1926. [Received October, 1927.]

The author briefly reviews the work previously done by various investigators of d'Hérelle's bacteriophage, including the studies of its action on plant pathogens [most of which have already been noticed in this *Review*]. In discussing the possibilities of its application in phytopathology he expresses the view that eventually a method will be evolved by which bacterial diseases of plants may be prevented by the immunization of the latter by means of the bacteriophage [*R.A.M.*, v, p. 756]. In conclusion, he very lucidly summarizes the chief properties so far established of the bacteriophage. A bibliography of 115 titles is appended.

ARNAUDI (C.). **A propos de quelques expériences sur l'immunité acquise des végétaux.** [Experiments on acquired immunity in plants.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 2, pp. 103–112, 1927.

After summing up the results of previous investigations on acquired immunity in plants, the author describes in some detail a number of experiments carried out by himself and Vigliano at the Serotherapeutical Institute of Milan. As regards the formation of specific antibodies in plants, the results of these experiments proved negative. An attempt at immunization was made with geraniums infected with *B*[*acterium*] *tumefaciens* [*R.A.M.*, v, p. 683], and it was found that immunity can be induced in such plants when the secondary inoculation is made a few centimetres above or below the existing tumour. Acquired passive immunization can also occur when a geranium, bearing a tumour, is made to absorb an agglutinating serum for *Bact. tumefaciens* obtained from a rabbit. Regression was very rapid (a fortnight) in such cases; geranium shoots which were placed in a serum active against *Bact. tumefaciens* showed no tumours after inoculation, whilst the controls, imme in water and inoculated simultaneously with these shoots, developed the ordinary type of tumour. The author concludes that, for the time being, his experiments justify the belief that the artificial immunization of plants is possible, though it is not necessarily linked with the formation of antibodies. A bibliography of Italian works on the subject is appended.

MAGROU (J.). **Recherches anatomiques et bactériologiques sur le cancer des plantes.** [Anatomical and bacteriological researches on plant cancer.]—*Ann. Inst. Pasteur*, xli, 7, pp. 785–800, 9 figs., 1927.

This is an expanded account of the author's investigations on the anatomy and bacteriology of crown gall (*Bacterium tumefaciens*) already noticed from another source [*R.A.M.*, vi, p. 149].

ANNAND (P. N.). **Tumors in Kale.**—*Science*, N.S., lxv, 1692, pp. 553–554, 1927.

Tumours of varying size, up to 2·5 cm. long by 1 to 1·5 cm. broad, were produced at San Mateo, California, in kale [*Brassica oleracea* var. *acephala*] by injections, by means of hard glass hollow needles, of solutions of different concentrations of sodium chloride, ethyl alcohol, and other substances. Not infrequently the proliferations broke through the leaf on both the upper and under sides. Both hyperplasia and hypertrophy occurred, with a disappearance of the chlorophyll from the tumour tissue. In many cases the phloem was involved as well as the parenchymatous tissue. No tumours were formed when empty needles were inserted, though a certain amount of callus tissue was produced. Large tumours were formed only during the spring rainy season, marked by abundant rainfall, minimum daily sunlight, and humid atmosphere. Very small tumours or none were formed during dry weather.

ROUSSAKOFF (L. F.). Ржавчина хлебов на Дальнем Востоке. [Cereal rusts in the Far East.]—Pamphlet of the *Amur Reg. Agric. Exper. Stat.*, Blagoveshtshensk, 35 pp., 5 figs., 1927.

This pamphlet gives a popular account of the principal cereal rusts prevalent in the Amur region [eastern Siberia]. From an economic point of view the most important is the stem rust of wheat [*Puccinia graminis*], which in some years, as, for instance, in 1923 and 1926, almost totally destroys the crop. Next comes the brown leaf rust of wheat [*P. triticina*], closely followed by the stem rust of oats [*P. graminis*]. As cereals in this region are for the most part spring sown, and the alternate hosts of the rusts (barberry and *Thalictrum* spp.) are hardly represented at all, it is believed that infection of the crops is effected by spores carried by wind from North Manchuria, where these diseases are widespread.

TETEREVNIKOVA (Mme D. N.). Наблюдения над биологическими рассами **Puccinia graminis** в окрестностях Детского Села. [Observations on biological races of *Puccinia graminis* in the neighbourhood of Detskoye Selo.]—Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, p. 202, 1927.

Investigations in the neighbourhood of Detskoye Selo [Government of Leningrad] revealed the occurrence there of the following biological forms of *Puccinia graminis*: f. *secalis* heavily attacking rye, *Agropyron repens*, and to a lesser degree barley, *Dactylis glomerata*, *Festuca pratensis*, *Bromus secalinus*, *B. arduennensis*, and *Alopecurus pratensis*; f. *avenae*, which is stated to be the most

widespread form, very severe on oats, and less so on *D. glomerata*, *Phleum pratense*, *F. pratensis*, *B. secalinus*, and *A. pratensis*; f. *phlei-pratensis*, severe on *P. pratense*, and less so on oats, *D. glomerata*, *F. pratensis*, and *A. pratensis*; and finally f. *tritici*, which was found in only one case on wheat.

GITMANN (L. S.). Опыты по применению паров формалина для борьбы с головней. [Experiments on the use of formalin vapour for the control of smut.]—Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, pp. 200–201, 1927.

Preliminary experiments showed that spores of cereal smuts [unspecified] perished within 10 minutes when subjected to the action of formalin vapour at room temperature, and in 10 to 15 seconds when the vapour was heated [temperature not given], while cereal seeds resisted similar treatment for 18 hours and 2 to 3 minutes respectively. Good field results are claimed to have been obtained with smutted cereal seeds treated by this process.

GARBOWSKI (L.). **Ustilago tritici (Pers.) Jensen sur les gaînes foliaires du Blé.** [*Ustilago tritici* (Pers.) Jensen on the leaf sheaths of Wheat].—*Rev. Path. Vég. et Ent. Agric.*, xiv, 2, pp. 100–102, 2 figs., 1927.

A specimen of wheat was found affected by *Ustilago tritici* on the base of the leaf sheaths at and just above the lower nodes, spore masses being formed in lines in the hollows between the veins. On examination, no trace of the mycelium of *U. tritici* could be detected either between the thick-walled cells of the sheath or in the neighbourhood of the spores. The author concludes that the hyphae concentrated at the nodes of infected plants must have passed to the surface and formed external spores, the whole of the mycelium being consumed in the process.

GORSHTSHARUK (Mme M.). О применении в больших хозяйствах метода протравливания Пшеницы горячей водой против пыльной головни. [Hot water treatment of Wheat seed against loose smut on large estates.]—*Le Défense des Plantes*, Leningrad, iv, 2, pp. 349–354, 1927.

The author describes at length a method devised by her in 1925 for the rapid treatment by hot water of large lots of wheat seed against loose smut (*Ustilago tritici*). In its essential features it consists in dipping pre-warmed seed contained in large wicker baskets lined with coarse canvas into vats with water maintained at 52° C. and moving the baskets up and down in the water for 7 minutes to ensure a uniform heating of the grain; cold water is then poured over the seed to cool it down rapidly, and it is finally air-dried on large canvas sheets for two days. The author claims to have been able by this method to treat about 100 poods [1 pood = 36 lb.] in a 10-hour working day with the help of a small personnel of four to five people. The germination of the seed was not materially injured, and the crops raised from it were remarkable for their freedom from the disease.

MAKLAKOVA (Mlle G. F.). Отчет по работе над влиянием различных методов дезинфекции зерна на развитие твердой головни Пшеницы. [Report of experiments on the effect of various methods of seed disinfection on the development of bunt of Wheat.]—*La Défense des Plantes*, Leningrad, iv, 2, pp. 343–349, 1927.

Details are given of experiments carried out in 1926 at the North Caucasus Plant Protection Station to test the efficacy of various seed disinfectants in the control of wheat bunt (*Tilletia foetans*) [*T. levis*]. The author is led to the conclusion that under local conditions the best results, both in regard to freedom of the plants from the disease and yield of the crop, are obtained with formalin. Copper sulphate greatly reduced the germination of the seed, while copper carbonate and copper sulphate dusts, tillantin, and uspulun are much too costly (although almost as efficient as formalin) to warrant their widespread use in the Caucasus.

JEFFERIS (A. T.). **Seed pickling.**—*Journ. Dept. Agric. South Australia*, xxx, 11, pp. 1128–1132, 1927.

Tests of the relative efficacy of disinfectants against wheat bunt [*Tilletia tritici*] made at Roseworthy College, South Australia, showed that basic copper carbonate, used as a dust, with or without the addition of calcium sulphate, had no ill effect on the germination of wheat, when quantities not exceeding 3 oz. per bushel of seed were used. Dehydrated copper sulphate, when used in excess of 2½ oz. per bushel of seed, produced a very slight decrease in germination. Used as a steep, copper sulphate delayed or prevented germination, its action in this respect proving proportionate to the strength of solution used. The usual 1 per cent. solution destroyed from one-third to one-half of the seed which would normally have germinated. Solutions of formalin up to ½ per cent. strength had no effect on germination.

Dry treatment with basic copper carbonate proved reasonably efficient in controlling the disease (1·20 per cent. affected plants) when used at the rate of 2 oz. for each bushel of seed. Dehydrated copper sulphate, used at the same rate, eliminated bunt completely, but this compound tends to lose its fineness after keeping. Commercial formalin (35 per cent. strength), used at a dilution of 1 in 400, also gave complete control of the disease and was harmless if applied immediately before seeding. A solution of greater strength should not be used. The untreated plants showed 31·44 per cent. infection, the seed used throughout the experiments being artificially contaminated at the rate of 1 part of spores to 1,000 parts by weight of seed.

FISH (S.). **'Take-all' in Wheat. Field observations at Murrayville.**—*Journ. Dept. Agric. Victoria*, xxv, 7, pp. 423–425, 1927.

Serious damage was caused in 1926 to the wheat crops in the Murrayville district of Victoria by take-all (*Ophiobolus graminis* and *Wojnowicia graminis*) [*R.A.M.*, v, p. 223], the reduction in yield ranging from 5 to 60 per cent. No difference in the degree of resistance to infection was observed in any of the twelve varie-

ties suffering from the disease. A higher incidence of infection was found on the Mallee grey than on the Mallee red soils, the percentage of lime of the former being 1·986 to 2·816 compared with 0·138 to 0·162 in the latter. An investigation of the cultural methods practised on two farms indicated that burning the stubble, early fallowing, and eradication of barley grass (*Hordeum murinum*) [ibid., v, p. 213] and silver grass (*Festuca bromoides*) are valuable measures for the control of this disease.

HITIER (H.) & BRÉTIGNIÈRE (L.). **Le piétin. Une enquête du 'Journal d'Agriculture Pratique'.** [Foot rot. An inquiry by the *Journal d'Agriculture Pratique*.]—*Journ. d'Agric. Prat.*, xci, 30, pp. 69–70, 1927.

The extraordinary intensity characterizing the current year's attacks of foot rot of wheat (*Ophiobolus graminis* and *Leptosphaeria herpotrichoides*) in France [*R.A.M.*, vi, p. 280] has induced the editors of the *Journal d'Agriculture Pratique* to conduct an inquiry into the conditions governing the development of this disastrous malady. Readers of the *Journal* in France and elsewhere are asked to communicate their personal observations on the disease. Some practical suggestions are made as to the various aspects of the problem to be studied. In the two succeeding numbers (30th July and 6th August) an article entitled 'Enquête et observations sur la maladie du piétin (pied noir des céréales)', which originally appeared in the same periodical in 1913, is reprinted.

LEBEDEVA (Mme L. A.). О грибе из р. **Marssonia** на Ячмене. [A fungus of the genus *Marssonia* parasitic on Barley.]—Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, p. 200, 1927.

A large number of cultivated varieties of barley were found in 1926 in the government of Stavropol [northern Caucasus] to bear on the leaves numerous white spots caused by a species of *Marssonia* [*Marssonina*]. So far as the author is aware this disease has occurred only very rarely, if at all, within the limits of European Russia, and the present severe and extensive outbreak is therefore regarded with some concern as to its further possible consequences. Field observations indicate the existence of considerable variations in the susceptibility of barley varieties and strains to the disease.

GESCHELE (E. E.). Отношение разновидностей ячменя к поражению **Helminthosporium teres.** [Behaviour of varieties of Barley in regard to attacks of *Helminthosporium teres*.]—Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, p. 202, 1927.

Observations extending over two years, on the reaction of 325 pure lines of barley to infection with *Helminthosporium teres*, *H. gramineum*, and *H. sativum* at the Ekaterinoslav Experimental Agricultural Station showed considerable specific and varietal variations in susceptibility. As a class, two-rowed barleys proved to be more resistant than six-rowed. Among the four-rowed barleys the black varieties (*Hordeum vulgare* var. *nigrum* and

var. *leiorhynchum*) were very susceptible, while the naked and furcated barleys exhibited a relatively high degree of resistance. The author believes that susceptibility and resistance to *Helminthosporium* might perhaps prove of some use in the systematic study of barley for the differentiation of small genetic units.

WESTERMEIER (K.). **Nass- oder Trockenbeize?** [Liquid or dry seed disinfection?]—*Pflanzenbau*, iii, 23, pp. 366–369, 1 fig., 1927.

After summarizing the comparative merits of the liquid and dry methods of seed disinfection from a theoretical standpoint, the author states that, according to his observations, dusts are very liable to be washed off the seed-grain by soil moisture due to rain before they have time to take effect. He describes in detail laboratory tests which were conducted to determine the effect of watering on the action of various preparations used for the control of *Fusarium* disease of rye [*Calonectria graminicola*]. The seed-grain was sown, after treatment, in sand and brick dust in two series of pots, one of which was kept damp by watering while the other was left dry. The percentages of healthy seedlings in the watered series were as follows: germisan, 42·5; kalimat B, 29·5; tillantin [uspulun-universal], 38; uspulun, 42; höchst [tillantin] dust, 19; and abavit B, 25·5. The corresponding figures in the dry pots were 80·5, 79, 80·5, 88, 82·5, and 77·5, respectively. The differences in favour of the liquid preparations are apparent, though even these were adversely influenced by the copious watering. As long as the dusts remain so readily affected by rain they cannot be recommended for general use.

MOLZ (E.). **Kritische Betrachtungen zu dem Artikel: Dr. Westermeier, 'Nass- oder Trockenbeize?'** [Critical observations on Dr. Westermeier's article: Liquid or dry seed disinfection?']—*Pflanzenbau*, iv, 2, pp. 30–31, 1927.

The writer takes exception to Westermeier's rejection of dusts for the disinfection of seed-grain [see preceding abstract] on the grounds that the conditions of his experiments were highly abnormal and most unlikely to be reproduced in nature. It is also pointed out that höchst [tillantin] dust [which gave the worst results in the experiments] is not one of the preparations officially recommended for the control of *Fusarium* disease of rye [*Calonectria graminicola*]. The inspection of a large number of rye fields, in which the grain was treated in the autumn of 1926 with abavit B, tutan, and uspulun dusts, has not revealed a single case of failure of these preparations. The well-known advantages of dusting are briefly recapitulated.

STEINDORFF (A.). **Vorläufige Stellungnahme zu dem Artikel: Dr. Westermeier. 'Nass- oder Trockenbeize?' und zu den kritischen Betrachtungen zu dem Artikel von Dr. E. Molz, Halle (Saale).** [Preliminary attitude to Dr. Westermeier's article: 'Liquid or dry seed disinfection?' and to the critical observations on the article by Dr. E. Molz, Halle (Saale).]—*Pflanzenbau*, iv, 5, p. 78, 1927.

The author questions the soundness of the objections raised by

Molz against the use of tillantin (formerly höchst dust) in Westermeier's experiments [see preceding abstracts] since in practice this preparation has proved very efficacious in the control of *Fusarium* disease of rye [*Calonectria graminicola*], and in the dry series of the experiments referred to, it gave better results than abavit B. It has recently (15th August, 1927) been officially recommended by the German Plant Protection Service for use against this disease.

GESCHELE (E. E.). О биологическихъ особенностяхъ **Ustilago reiliana.** [Biological peculiarities of *Ustilago reiliana*.]—Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, p. 202, 1927.

The author considers that *Ustilago reiliana* [*Sorosporium reilianum*] is not as rare a parasite of maize in Russia as it is generally believed to be, since it is frequently mistaken for *U. maydis* [*U. zeae*]. A study of the distribution of the mycelium of the fungus within the host tissues and the results of experiments in which maize plants were raised from seed contaminated with this organism, led the author to the conclusion that *S. reilianum* infects the seedlings during germination.

PETRI (L.). **Effetti del solfato di manganese sulle piante di Limone attaccate dal Colletotrichum gloeosporioides Penz.** [Effects of manganese sulphate on Lemon trees attacked by *Colletotrichum gloeosporioides* Penz.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 2, pp. 213–214, 1927.

The severity of attack of *Colletotrichum gloeosporioides* on lemon trees in Messina [*R.A.M.*, v, p. 736] is stated to be dependent on certain predisposing factors not yet clearly ascertained but probably associated with certain local conditions such as the nature of the soil and the cultural methods adopted. In this paper, the author briefly describes the effects on the disease observed after the application to the soil of manganese sulphate at the rate of 60 gm. per plant. On treated plots, the infection of newly-formed shoots commenced in March, but the spread of the mycelium was arrested a few centimetres from the point of infection. In the tissues of the branches of the treated trees a yellow gum deposit was found, which prevented the progress of the mycelium. This gum was clearly distinct from the alcohol-soluble gum-resin present in the susceptible plants. The author considers there is little doubt that this reaction may be attributed to the revitalizing effect of the manganese on the invaded cells. Further experiments will be necessary to determine the efficacy of the gum as a barrier to the fungus and of the treatment with manganese as a means of controlling the disease.

Queensland notes.—*Fruit World of Australasia*, xxviii, 6, p. 250, 1927.

The statement is made that the almost continuous rainfall in the earlier part of 1926 in Queensland resulted in the widespread distribution of *Sphaerostilbe coccophila* and *Ophionectria coccicola* attacking scale insects on citrus trees. The former is said to have

almost entirely destroyed the red scale in many instances. It is also stated that the Emperor Mandarin orange has proved to be entirely free from scab [*Sporotrichum citri*] in the Howard, Gaynach, and Byfield districts of Queensland, while exhibiting a high degree of susceptibility in other districts.

ROBLEDO (F. G.). **Labor desarrollada por la Oficina para la Defensa Agricola, durante el mes de Junio de 1927.** [Work of the Office for Crop Protection during the month of June, 1927.] —*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, i, 2, pp. 113–127, 1927.

According to reports received by the Mexican Office for Crop Protection, bud rot of the coco-nut palm [? *Phytophthora palmivora*] is present in the following localities of Mexico: Yucatan, coast of Campeche, Isla del Carmen, coast of Tabasco, coast of Colima, and coast of Jalisco. In the two last-named localities the disease is attributed by the growers to an insect which is stated to develop in the buds.

STEINMANN (A.). **Wortelziekten van de Koffie. (Een nieuwe wortelschimmel, Polyporus rubidus Berk.).** [Root diseases of Coffee. (A new root fungus, *Polyporus rubidus* Berk.).]—*Arch. voor Koffiecult.*, i, 1, pp. 79–81, 2 pl., 1925. [Received October, 1927.]

The normally saprophytic fungus, *Polyporus rubidus*, has been observed to occur in a parasitic form on the roots of Java and Robusta coffee [*Coffea arabica* and *C. robusta*] in West Java. The organism is readily distinguishable by its pale pink or flesh-coloured mycelium and fruit bodies. The surface of the sporophore is markedly zonate, often somewhat darker than the rest of the body, always smooth and shiny. The tubes measure from 3 mm. up to ± 1 cm. in depth, and the pores are about 0·1 mm. broad. Like some other Polyporaceae, *P. rubidus* is able to persist in the soil by means of its rhizomorphs. *Cassia occidentalis*, extensively used as a green manure, appears to be highly susceptible to infection by *P. rubidus*, which was found on one estate to have spread from this crop to coffee.

MUNRO (D. G.). **Spraying experiments in Coffee with various types of pumps.**—*Planters' Chron.*, xxii, 25, pp. 368–372, 1927.

These experiments were conducted at the Koorghully estates [South India], to test the efficacy of the following pumps in the spraying of coffee against leaf diseases [*Corticium koleroga*, etc.], namely, the Four Oaks Southern Cross [Four Oaks Spraying Machine Co., Sutton Coldfield, nr. Birmingham], Drake & Fletcher's No. 18 [Kentish Engineering Works, Maidstone, England], and Drake & Fletcher's D.S.P. Headland. The last-named, which was the largest and most satisfactory, was mounted on a platform; two 100 ft. lengths of hose were attached, each fitted with a 3 ft. brass rod and 'Mistifier' spray nozzles, the No. 1 centre-piece and smallest hole being used. The working team consisted of 8 coolies, and with both hoses in action the pump delivered on an average 4 galls. of mixture in 3 minutes.

The cost of the labour involved in spraying 3 acres of coffee, 1,750 trees per acre, was Rs. 30 [£2 5*s.*], but this should become less as the coolies acquire more skill. Water was pumped up by a semi-rotary pump, No. 2 size, with 300 ft. hose, to the place where the Bordeaux mixture (4–4–50) with resin soda (4 lb. and 2 lb., respectively) spray was being made. In all, 1,728 galls. of the mixture were used, costing Rs. 136·5 [£10 4*s.* 9*d.*]. Hence the total cost of labour and mixture amounted to Rs. 166·5. This compares very favourably with the cost of Rs. 93 per acre for spraying 30 acres on the same estate with a 10–10–4–2–50 solution the previous year, using container sprayers of the pressure type. This spraying was subsequently found to have increased the yield by about 4 cwt. per acre, equivalent to a gain of Rs. 280 per acre, so that even at Rs. 93 per acre spraying gave a handsome return to the planter [see also *R.A.M.*, vi, p. 666].

FAHMY (T.). **The Fusarium disease of Cotton (wilt) and its control.**—*Internat. Bull. of Plant Protect.*, i, 5, pp. 65–66, 1927.

A morphological and physiological study of the *Fusarium* responsible for the serious wilt disease of Sakel cotton in the delta region of Egypt [*R.A.M.*, vi, p. 290] is stated to have shown it to differ from *F. vasinfectum*, and the author is accordingly referring to it as *F. vasinfectum* var. *aegyptiacum*. On dilute Richards's solution the parasite produced a staling substance capable of causing wilt in healthy cotton seedlings. The parasite was isolated from layers of soil at a depth of one metre below the surface. A constant symptom of the disease is the discoloration, sometimes extending upwards into the stem, of the central cylinder of the root, while leaf mottling, death of the growing point, and stunting may or may not be present.

GOLDSTEIN (BESSIE). **An Empusa disease of Drosophila.**—*Mycologia*, xix, 3, pp. 97–109, 3 pl., 1927.

The present paper gives a detailed description of the cytology of a species of *Empusa* which is stated to have been of recent years responsible at Columbia University for epidemic outbreaks of a disease of the larger black fruit fly (*Drosophila repleta*) and to a lesser extent of the small red-eyed fruit fly (*D. melanogaster*), and which in its structural details is identical with *E. muscae*. The author found also in these flies resting spores similar to those described by her in dried house flies [*R.A.M.*, iii, p. 335].

In discussing the systematic relationship between the genera *Empusa* and *Entomophthora*, the author considers that the number of nuclei in the conidia and the branching of the conidiophores are sufficient features to warrant the separation of the two. The genus *Empusa*, as represented by *E. muscae*, is characterized by unbranched conidiophores which appear as simple, multinucleate tubes emerging only between the segments of the fly's body on the dorsal surface, and by multinucleate conidia. In the genus *Entomophthora* the conidiophores are branched, and each gives rise to a single uninucleate conidium; the conidiophores emerge in a coalescing mass over the

whole of the insect's body. Besides, in this genus there are usually present cystidia or sterile hyphae, and rhizoids which attach the dead insect to the substratum, while the flies killed by *Empusa* are attached to the substratum only by means of their probosces.

In conclusion, the author gives a classification of the genera of parasitic Entomophthoraceae, in which she includes *Lamia*, *Tarichium* (a provisional genus), *Triplosporium*, and *Massospora*, in addition to the genera mentioned above.

Provvedimenti per la lotta contro il 'calcino' del baco da seta. [Provisions for the control of muscardine of the silkworm.]—*L'Istria Agric.*, vii, 14, pp. 330–334, 1927.

The Italian *Gazzetta Ufficiale*, N.S., 141, of 20th June, 1927, published a Royal Decree of 19th May, 1927, which gives power to the Minister for Home Affairs to make obligatory the prompt notification of cases of the muscardine disease (*Botrytis* [*Beauveria*] *bassiana*) of silkworms, commonly called 'calcino' in Italy, and to prescribe regulations for its control. The execution of these measures will be supervised by the Royal Sericultural Stations of Ascoli, Piceno, and Padua, together with the travelling inspectors of agriculture and the National Sericultural Society. Properly authorized officials can enter premises where silkworms are being reared, and give instructions as to the measures to be adopted where the disease is present.

The ravages of muscardine are stated recently to have been both severe and extensive in Italy, the losses from it in 1926 being estimated at over 6,000,000 kg. of cocoons, of a value of more than 150,000,000 lire. The methods for its control are stated to be well known, and there is no reason to doubt that it can be greatly reduced by a combined effort on the part of all concerned.

Browne (D. C.). **The effects produced in the rabbit by feeding cultures of Monilia psilosis.**—*Proc. Soc. Exper. Biol. & Med.*, xxiv, 9, pp. 873–875, 1927.

Cultures of *Monilia psilosis* isolated from a human case of typical sprue [*R.A.M.*, vi, p. 486] were administered to nine rabbits, six of which died between the 31st and 61st day, while three remained perfectly normal. Two other rabbits were infected intravenously with 1·0 c.c. of the ten-day culture on 4 per cent. dextrose bouillon. Both animals died in about 24 hours, and a pure culture of the fungus was recovered from the heart's blood, kidneys, and liver of each. Six other rabbits fed with a bouillon growth of the other saccharomycetes isolated from the same patient remained healthy.

No specific syndrome corresponding to clinical sprue occurred in the animals used in the feeding experiments. Loss of weight and some anaemia were observed, but from the pathological standpoint the almost constant evidences of extensive blood destruction are of primary importance.

Montpellier (J.), Catanei (A.), & Clapier (P.). **Étude d'un mycétome à grains noirs dû à Glenospora clapieri Catanei, 1927.** [Study of a black-grained mycetoma due to *Glenospora*

clapieri Catanei, 1927.]—*Bull. Soc. Path. Exot.*, xx, 6, pp. 502–511, 4 figs., 1927.

In a mycetoma on the jaw of a Senegalese soldier the writers found a fungus with black grains constituted by a dense network of hyphae, measuring 2·5 to 3 μ in width, and with irregularly globular, terminal, or intercalary bodies, with average dimensions of 4 to 4·5 by 6·5 μ. It was isolated and determined as a *Glenospora* which grew better at 37° than at 22° C., and to which the name *G. clapieri* is given as it is considered to differ from other known species of the genus. The aleuroid spores are smooth, generally ovoid, sometimes truncate at the base, and measure 6·5 to 9 by 5 to 6 μ. Large brownish-black bodies (10·5 to 15 by 9 to 15 μ) were also observed.

Pijper (A.) & Pullinger (B. Davidine). **South African nocardiases.**—*Journ. Trop. Med. and Hygiene*, xxx, 12, pp. 153–156, 2 pl., 1927.

The writers give a brief résumé of their experience of South African nocardiases, and describe in detail three cases of actinomycotic mycetoma in natives, two in the foot and one in the thoracic wall. All three are attributed to hitherto undescribed species of *Nocardia* [*Actinomyces*], which are named *N.* [*A.*] *transvalensis*, *N.* [*A.*] *africana*, and *N.* [*A.*] *pretoriana*. The morphological and cultural characters of the three species are indicated.

Salmon (E. S.) & Ware (W. M.). **The powdery mildew of Flax.**—*Gard. Chron.*, lxxxii, 2115, pp. 34–35, 1 fig., 1927.

In March, 1927, the authors received from Dr. A. W. Henry a powdery mildew found on the stem and leaves of flax seedlings (*Linum usitatissimum*), grown in a greenhouse at the Botany School, Cambridge. The characters of this mildew seemed to agree with those of the mildew found on flax in the conidial stage by Skorić in Croatia, and named by him *Oidium lini* [*R.A.M.*, vi, p. 124]. These characters are stated to agree in all respects with those of the conidial stage of *Erysiphe polygoni* on certain hosts, and the fungus may possibly prove to be that species. Its occurrence on flax has not been reported previously in England, but several other records of a powdery mildew on flax in European literature are cited. It does not appear ever to have been found in the perithecial stage, so that its perfect name cannot be definitely determined.

Szembel (S. J.). Микологические заметки. I. Новый вид ржавчины на Конопле. [Mycological notes. I. A new species of rust on Hemp.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, i, 5–6, p. 59, 1927. [French summary.]

In the spring of 1924 the author found the lower leaves of some wild hemp plants (*Cannabis ruderalis*) in the neighbourhood of Astrakhan, Russia, bearing sparse, globular, orange-coloured aecidia, measuring 360 to 400 by 300 to 340 μ, of a hitherto undescribed rust to which he gives the name *Aecidium cannabis*. The aecidiospores are round or ellipsoidal, hyaline, verrucose, 24 to 28 by 20 to 24 μ

in diameter, and with an epispore 1·5 to 2 μ thick. A Latin diagnosis of the fungus is appended.

SZEMBEL (S. J.). Микологические заметки. 2. Грибы, вызывающие порчу рыболовных сетей. [Mycological notes. 2. Fungi rotting fishing nets.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, i, 5–6, pp. 59–60, 1927. [French summary.]

Fishing nets stored under very damp conditions in the neighbourhood of Astrakhan, Russia, were found to have been considerably damaged by two moulds, one of which was identified as *Chaetomium comatum*. The second fungus was somewhat less conspicuous, and formed a lemon-yellow efflorescence especially at the corners of the meshes where the strands were badly decayed. Its hyphae are branched, septate, brown, and up to 2 μ broad; the conidia are easily detachable, hyaline (yellowish in mass), oval or rounded, and 2 to 3 μ in diameter. As this organism does not seem to have been described hitherto, the author names it *Sporotrichum sagenae* and gives a brief Latin diagnosis.

PAPE (H.). **Das verheerende Auftreten der Kraüselkrankheit bei Pelargonien.** [The devastating occurrence of the curl disease of *Pelargonium*.]—*Gartenwelt*, xxxi, 22, pp. 329–331, 2 figs., 1927.

Further particulars are given concerning an obscure leaf spot and curl of *Pelargonium zonale* which appears to be spreading widely in different parts of Germany [*R.A.M.*, vi, p. 34]. It is characterized by the appearance on the young leaves of small, round or angular, yellowish spots, 0·5 to 2 mm. in diameter, and often densely crowded. Later, the tissue in the centre of each spot dries up and turns brown. As the leaves are still expanding around the spots, curling, blistering, and distortion of the leaf blade results. The stem and roots appear to be quite healthy, and the plants sometimes recover. In some Berlin nurseries inspected by the writer the incidence of the disease amounted to 80 per cent. The Rubin, Schöne von Murgthal, Poitevine, Meteor, Ulma, and Theodor Lerchenmüller varieties are very susceptible, while Purpurkönig, Olga von Württemberg, and Vollendung are somewhat less so. *P. peltatum* and the salmon-pink varieties of *P. zonale* are resistant. The cause of the leaf symptoms has not been ascertained, but they show a striking similarity to those of certain virus diseases. Possibly a number of distinct causes may be responsible for the somewhat variable symptoms that have been observed. Control measures should be based on thorough sanitation, supplemented by spraying with a standard insecticide where the leaf aphids are suspected of contributing to the spread of the disease.

In a note on the practical aspect of the disease (p. 332), F. Müller emphasizes the importance of heat and drought in its development. The leaf spot, which the writer thinks may be due to a fungus or to nutritional and metabolic disturbances, may be controlled by frequent watering of the plants during warm weather and by spraying with lime-sulphur or uspulun (the former being more suitable for adult plants and the latter for young ones).

LAUBERT [R.]. **Zur 'Kräuselkrankheit bei Pelargonien'.** [On the curl disease of *Pelargonium*.]—*Gartenwelt*, xxxi, 26, p. 391, 1927.

Referring to Pape's view that the leaf curl of *Pelargonium* [see preceding abstract] may represent the combined symptoms of several distinct diseases or injuries, the writer points out that certain plant bugs (*Lygus*) are capable of causing a similar condition. On the other hand, some of the symptoms of leaf curl cannot be ascribed to insect injury, and the etiology of the disease remains obscure pending further investigations.

TUINMANN (F.). **Eine weitere Blattkrankheit der Pelargonien?** [Another leaf disease of *Pelargonium*?]—*Gartenwelt*, xxxi, 25, pp. 375–376, 1927.

The writer has observed an apparently new disease of *Pelargonium zonale* and *P. peltatum* in the Thun district of Switzerland. From July onwards through the autumn infection spreads rapidly, and since the first detection of the disease, two years ago, it has extended considerably. The under sides of the leaves develop a varying number of small, dark green (later greyish-brown), water soaked or glassy spots with whitish-grey centres. The lesions extend and sometimes coalesce, and eventually the entire leaf shrivels. The buds and involucral leaves are also attacked. This very serious disease, which appears to be undoubtedly caused by a fungus, has not proved amenable to ordinary control measures, though dusting with sulphur-copper acetate (Maag, Dielsdorf, Zurich) effected a certain improvement. The leaf spot was observed in 1926 on imported ivy geraniums, and similar symptoms have been noticed on pansies [*Viola tricolor*].

FLACHS. **Blattfleckenkrankheiten an Stiefmütterchen.** [Leaf spot diseases of Pansies.]—*Blumen- und Pflanzenbau*, lxxiii, 11, pp. 162–163, 5 figs., 1927.

At the end of April the writer observed a remarkable discoloration of pansy [*Viola tricolor*] leaves associated with infection by *Ramularia lactea* and *R. agrestis*. The former, which occurs also on *V. odorata* and other species of violets, produces circular or elongated, brownish to whitish spots, measuring 5 mm. or more in diameter and generally separated from the healthy tissue by a well-defined brown margin. The conidiophores, emerging from the stomata, measure 30 to 60 μ in length and 1 to 4 μ in thickness. The oval to fusiform, mostly unicellular conidia are 7 to 20 μ long by 2 to 3 μ broad [*R.A.M.*, iv, p. 37].

R. agrestis forms similar, but smaller, circular or semi-circular spots, which are depressed, pale green to yellowish, with a dark green centre and a narrow margin, concentrically banded. The affected tissues fall out, imparting a shot-hole appearance to the leaves. Hyaline, fasciculate, non-septate conidiophores, bearing bi- or pluri-cellular conidia, 15 to 32 by 4 to 7 μ, emerge from the stomata on both leaf surfaces. This fungus has also been reported to occur on *V. altaica*.

PAPE (H.). **Gloeosporium-Krankheit in Maiblumenkulturen.** [*Gloeosporium* disease among cultivated Lilies of the Valley.] —*Gartenwelt*, xxxi, 23, pp. 344–346, 1 fig., 1927.

Severe damage was caused among cultivated lilies of the valley (*Convallaria majalis*) near Görlitz (Silesia) in 1924 and 1925 by an apparently new disease associated with a species of *Gloeosporium*. In 1925 the disease was also reported from Bielefeld [Westphalia]. Circular or oval, yellowish, later brown, sometimes coalescent spots, surrounded by a reddish or brownish-red margin and ranging from 0·25 to 2 cm. in diameter, appear on both sides of the leaf. Subsequently the centres of the lesions become hyaline and translucent, and the dead tissue falls out, giving the foliage a torn and ragged appearance. Similar spots appear on the petioles and pedicels, and in severe cases the leaf blade may be completely destroyed. The root system, though healthy, is generally weak.

The symptoms developed on beds in the open about five weeks after the unfolding of the leaves. Infection spread from the tips downwards, and by the middle of September the foliage was as withered as it normally is two or three months later. The disease is estimated to have caused a loss of 95 per cent. in the stand, corresponding to a value of at least Mk. 2,000.

Two types of spores were found in the slime on the leaf surface, namely, macrospores measuring 7 to 12 by 1·5 to 2 μ and microspores measuring 2·5 to 4 by 0·5 to 1 μ. The spores are cylindrical, rounded at the ends, hyaline, and unicellular. These dimensions differentiate the fungus from *G. convallariae* Allescher (*Hedwigia*, p. 277, 1895), the spores of which measure 3 to 5 by 1 to 1·5 μ.

The manner in which the fungus was introduced into the beds has not yet been ascertained, but possibly it was present in the manure applied during the autumn and winter. Control measures should be based on thorough sanitation, supplemented by repeated applications of a standard fungicide during the spring.

ANTOKOLSKAYA (Mme M. P.). О **Sclerotinia libertiana** на Подсолнечнике. [Notes on *Sclerotinia libertiana* on the Sunflower.]—Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, p. 201, 1927.

In continuation of Mlle Rogatsch-Maljutin's investigation [*R.A.M.*, iv, p. 289] of the disease of sunflowers caused by *Sclerotinia libertiana* [*S. sclerotiorum*] in Russia, the author has established that, contrary to the results obtained by her predecessor, the ascospores of the fungus are capable of infecting both healthy and wounded host tissues. It was also found that the desiccated and powdered mycelium preserves its infective capacity for considerable periods of time. Sunflower seeds received from the Caucasus infected with apparently an identical fungus, failed to produce infected progeny under the conditions obtaining in the Government of Leningrad, thus indicating the existence of at least two races of the organism which differ from each other by important biological features.

HOLLOWELL (E. A.), MONTEITH (J.), & FLINT (W. P.). **Leafhopper injury to Clover.**—*Phytopath.*, xvii, 6, pp. 399–404, 3 figs., 1927.

This is a more detailed account of the authors' investigations on leafhopper injury to clover associated with *Empoasca fabae* [this name for the potato leafhopper being now adopted in preference to *E. mali*] than that already published [*R.A.M.*, vi, p. 490].

FLACHS. **Achtung auf den Kleekrebs.** [Beware of Clover canker.] —*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 3, pp. 69–70, 1927.

Samples of badly overwintered clover submitted to the Bavarian Agricultural Institute revealed the presence of clover canker or stem rot (*Sclerotinia trifoliorum*) [*R.A.M.*, vi, p. 98]. This fungus attacked chiefly the seedlings of red and crimson clover [*Trifolium pratense* and *T. incarnatum*] and is most injurious in years with a cool, rainy autumn and a relatively mild winter. Beyond strengthening the seedlings by suitable fertilization, for instance with a weak concentration of nitrate of soda, no means of controlling this disease are known. Although deep ploughing after a crop of diseased plants, in order to bury the sclerotia and prevent the germination of the spores, has been recommended, and frequent changes of crop have been tried, the fungus has been found to live in the soil for as long as six years. Disinfection of the seed may prove valuable and attention should be paid to the use of suitable crops in rotation; clover has been found to be especially susceptible to this disease when grown after beet.

PAPE (H.). **Krankheiten und Schädlinge der Lupine.** [Diseases and pests of the Lupin.]—*Illus. Landw. Zeit.*, xlvii, 24, pp. 316–318, 7 figs., 1927.

Notes are given on some important fungous diseases of lupins, the area under which in Germany is stated to have been greatly extended of recent years. Root rot of the seedlings, with decay of the collar, is caused by *Pythium de Baryanum* and *Thielavia basicola*, the latter organism also attacking mature plants. This disease is best controlled by a suitable crop rotation.

Foot rots and wilts are caused by a variety of organisms, including *Fusarium vasinfectum* and other species, which penetrate the roots or stem bases and advance upwards through the vascular bundles. Similar symptoms are associated with infection by *Verticillium albo-atrum*. *Chalaropis thielavioides* (*Staz. sper. agric. ital.*, xlix, p. 583, 1916) produces brownish lesions, covered with whitish, later black spore dust, on the stem bases. The fungus penetrates the plants through small wounds and facilitates the subsequent entrance of *F. vasinfectum*, *Sclerotinia sclerotiorum*, and other parasites. Blackleg, due to *Bacillus caulivorus* and *B. phytophthorus* [*B. atrosepticus*], causes a black discoloration and disintegration of the roots, accompanied by wilting and desiccation of the aerial organs. No direct measures are known for the control of these diseases, which may, however, be prevented to some extent by judicious cultural methods and seed treatment with a standard fungicide.

S. sclerotiorum produces a fairly extensive water soaked, dis-

coloured lesion on the stem, the interior (and in damp weather also the surface) of which is occupied by the mycelium and sclerotia of the fungus. Affected plants wilt and die above the point of attack. This disease may be combated by the avoidance of excessively close planting and of damp sites for cultivation. The fungus may also attack the pods and seeds. *Botrytis cinerea* forms greyish-green to brownish lesions on the lower part of the stem and causes the death of the upper portions of the plant; similar measures to those employed against *S. sclerotiorum* are effective in its control.

Pale to brownish, fairly large spots are formed on the stems by *Cryptosporium leptostromiforme*, the spores of which develop in the spring from the overwintered black, elongated perithecia and cause fresh infection. The stubble should be deeply ploughed under and in serious cases the cultivation of lupins should be discontinued for several years.

Mildew (*Erysiphe polygoni*) may cause more or less complete defoliation before the seeds reach maturity, but may be checked by sulphuring. *Ceratophorum setosum* [*R.A.M.*, v, p. 391] produces irregular, sharply defined, reddish-brown to very dark spots on the leaves and causes discoloration, deformation, and premature defoliation. This fungus may also attack the pods and penetrate to the seeds. *Lupinus cruikshankii* and *L. mutabilis* are the most susceptible varieties to it, the white and yellow lupins (*L. albus* and *L. luteus*) being comparatively resistant. Numerous irregular, very dark brown, frequently convergent spots are produced on the foliage and pods by *Ascochyta lupinicola*, which often destroys large areas of the lamina or even the whole leaf. Very serious damage has recently been caused by this fungus in Moravia and Galicia, where the leaves are often dead by the middle of August. Leaf diseases of minor importance are caused by the rusts *Uromyces renovatus* and *U. lupinicolus*, as well as by *Bacillus elegans*.

The use of selected seed, supplemented by disinfection with a standard fungicide, is recommended as a precaution against seed-borne diseases.

BRYAN (MARY K.). **The flagella of Bacillus amylovorus.**—*Phytopath.*, xvii, 6, p. 405, 1 pl., 1927.

Referring to Rosen's statement that the fireblight organism (*Bacillus amylovorus*) is usually furnished with only a single polar flagellum [*R.A.M.*, v, p. 368], the writer has examined cultures isolated from apple, pear, and *Crataegus* in widely separated parts of the United States, and observed numerous peritrichiate rods in every case, on staining by the Casares-Gil method. Some rods, however, show only one flagellum; these are stated to be of common occurrence in preparations of any multiflagellate pathogen. It is suggested either that Rosen was working with some other organism or that his bacteria were deprived of most of their flagella by the staining process.

WOODWARD (R. C.). **Studies on Podosphaera leucotricha (Ell. & Ev.) Salm. I. The mode of perennation.**—*Trans. Brit. Mycol. Soc.*, xii, 2–3, pp. 173–204, 2 pl., 1 fig., 1927.

This is a detailed report of the author's investigation of the mode

of perennation of the apple mildew (*Podosphaera leucotricha*), which in recent years has become increasingly prevalent in England in spite of all attempts to control it. The results of the work, most of which was carried out at the Botany School, Cambridge, and completed at the School of Rural Economy, Oxford, show that the fungus is carried over the winter in the form of hyphae and haustoria within dormant apple buds. The infection of axillary and terminal buds on one-year-old wood, and of blossom buds on spurs occurs soon after their formation and while they are still inadequately protected by bud scales; the invading hyphae originate from mycelium established on the young shoots. Transverse sections of infected dormant buds made at monthly intervals, showed that the fungus is maintained in a living condition throughout the winter, and that the period of its dormancy within the buds is roughly eleven months. The presence within the bud tissues of haustoria, which are believed to play an important part in perennation, affords a means for the immediate identification of the mycelium. A ready means for the detection of infected buds in the spring is provided by the fact that their date of opening is considerably delayed in comparison with that of their disease-free neighbours. Observations indicated that only 40 to 50 per cent. of the visibly mildewed twigs bear buds that open in an infected condition. The perennation of the fungus is also greatly favoured by the peculiarity that apple blossom buds contain leaves and an embryo shoot in addition to flowers. On the bursting of the blossom bud, the mycelium fructifies freely and often the blossoms are entirely destroyed. The embryo shoot is soon produced, and as it is in close contact with infection, falls a direct prey to the mildew, and its axillary buds are then invaded.

In a detailed discussion of the morphology and functions of the perithecia (the formation of which is stated to be favoured by severe hyphal infection of the host in a young stage), the author considers that under English conditions it is impossible to ascribe to them any part in the life-history of the disease. From September onwards most of them are in a shrivelled condition, characterized by a depression on their upper surface which does not fill up even when the perithecia are kept in moisture-saturated chambers, and the rest were found to be apparently non-viable.

Experiments to test the conditions necessary for the germination of conidia showed that surplus water on the leaf surface is unfavourable. A dry, healthy leaf in a turgid condition (either apple or oak) was shown to provide a substratum favourable to germination and rapid extension of infection. Freezing did not stimulate germination. Temperatures between 10° and 15° C. are the most favourable for germination; 20° favours the growth of germ-tubes, and at 33° the conidia are killed.

Microscopical preparations indicated that the fungus penetrates the cuticle of the host rather by chemical than by mechanical action. Two or more, usually uninucleate, haustoria may be present in an epidermal cell.

The author considers, on the ground of his observations, that the importance of secondary infection in the spread of the disease has been over-stressed, and that no general infection arises other than

that which develops from infected buds. Occasionally the infection is extended by fresh foliage which develops later in the season, following 'die-back' brought about by severe attacks of the mildew or of the capsid *Plesiocoris rugicollis*.

Successful cross-inoculation experiments with material from various varieties of the apple, quince, and pear showed the absence of any specialization in *P. leucotricha*, but apple varieties were found to vary in their susceptibility to the mildew. Generally speaking, the so-called Russian varieties and soft apple varieties are the most susceptible, but the soil and general cultural practices, both of which determine the vigour of the trees, are stated to be largely responsible for epidemics and outbreaks of the disease.

Attempts to control the disease by spraying for the prevention of bud infection have not proved successful.

HOCKEY (J. F.). **Studies in fruit diseases: Apple scab.**—*Canada Dept. of Agric. Pamphlet* 82, N. S., 7 pp., 3 figs., 1927.

A brief, popular account is given of the symptoms and mode of infection of apple scab (*Venturia inaequalis*), for the control of which the usual spraying schedule with standard fungicides is recommended.

The losses sustained by apple growers in Nova Scotia from this disease are estimated to have amounted to at least $750,000 in 1925, while in 1926 the yield was less than half the normal. In both seasons, unsprayed orchards suffered a loss of approximately $200 per acre.

DILLON-WESTON (W. A. R.). **A note on the 'bud-rot' of Apple trees.**—*Trans. Brit. Mycol. Soc.*, xii, 2–3, pp. 170–172, 1927.

A very brief description is given of a disease of the flower buds of the apple which was first noticed by Salmon and Wormald in 1912, and the chief symptom of which is the failure of the buds to open in the spring, while later in the season a weft of salmon-pink mycelium may generally be found between the bud scales, microscopical examination revealing the presence of a species of *Fusarium*. The spores examined by the author in 1925 were pointed, cylindrical, 3- to 6-septate, 24 to 40 by 3·5 to 4 μ in diameter. Wollenweber, to whom a culture of the fungus was submitted, states that the conidia obtained by him from a sub-culture of the organism, correspond with those of *F. fructigenum* Fr. [*R.A.M.*, iv, pp. 174, 226] in size and septation, and might as well be identified with *F. blackmani* [ibid., iv, p. 421; v, p. 389], if the latter species is uniform; further, it is probably identical with *F. gemmiperda* described by Aderhold in 1901 [see also ibid., iii, p. 317 and Roberts—*Journ. Agric. Res.*, xxvi, 10, p. 507, 1923].

In the Isle of Ely the Emneth Early is the variety of apple most susceptible to the disease, from 30 to 50 per cent. of the buds having been attacked in some cases in 1925, while Bramley's Seedling, Newton Wonder, and Worcester Pearmain were but slightly affected. The intensity of the disease appears to be favoured by a wet summer and autumn during the preceding season.

RIGG (T.) & TILLER (L.). **A report of certain diseases of the Apple in the Nelson district, N.Z., 1925–26.**—*Journ. Pomol. and Hort. Science*, vi, 2, pp. 113–127, 2 pl., 1927.

A description is given of a diseased condition of apples which was first noticed in the summer of 1924 in several orchards on the hills at Braeburn and Umukiri in New Zealand, and which recurred to a much greater extent in the same orchards in 1925, when it was also observed in various localities of the Moutere Hills. It was characterized by the occurrence of small dark areas, soft, and often with a drop of clear liquid at the centre, on the surface of young fruit. These became depressed later, and the fruit was often seriously deformed. In other cases the surface appeared healthy, but there were corky areas in the flesh or a brown area around the core. In many respects the symptoms and occurrence of the trouble are strongly suggestive of those of 'drought spot' and 'cork' as described by Mix, and Brooks and Fisher, but differ from the latter in that the tissue round the core may assume a brown discoloration without formation of corky areas in the flesh.

The results of an investigation of the conditions under which the trouble arose indicate that somewhat similar factors may be involved in the production of the three types of disease. The trouble appeared chiefly in places where the top soil is shallow, with an unsuitable subsoil, while, where the soil is deep, little damage was done; it was most severe wherever the soil conditions encouraged surface rooting or rendered the roots liable to be injured by waterlogging or by agricultural implements. There was also evidence that deficiency of soil moisture was one of the most important factors, although chronic drought conditions did not appear to lead to the appearance of the trouble. The authors believe that the injury to the apple crop in the two years under consideration may be explained best as being due to a temporarily insufficient supply of water from the roots of the trees at a time when transpiration from the leaves was considerable. They are also of the opinion that it is extremely doubtful, at least in certain cases, whether anything can be done profitably to ensure a complete freedom of the orchards from the trouble.

ZELLER (S. M.). **A canker of Apple and Pear trees caused by Glutinium macrosporum, n. sp.**—*Journ. Agric. Res.*, xxxiv, 5, pp. 489–496, 10 figs., 1927.

The present paper gives a brief description, chiefly based on unpublished observations by Rees at the Oregon Agricultural Experiment Station in 1912, of a new species of *Glutinium* which has been found associated with cankers on the bark of apple and pear trees in western Oregon, and which the author names *G. macrosporum*. The pycnidia of the fungus, which may appear at any point on the dead bark within the cankers, are olivaceous to black, drying with a white, flaky exudate, cylindrical, often tapering towards the apex, 1 to 2 mm. high, 0·6 to 0·8 mm. in diameter at the base, and ostiolate; they have an internal, cylindrical cavity lined with simple to slightly branched conidiophores. The spores are ellipsoid, hyaline, one-guttulate, 15 to 28 by 8 to 10·5 μ in diameter. In culture on apple stems, Lima bean agar, and prune

agar, two types of spores were formed on the mycelium, the larger 18 to 22 by 8 μ and the smaller 6 to 10 by 2 μ. On sweet clover [*Melilotus alba*] stems typical pycnidia were produced. The germination of the pycnospores is preceded by the formation of transverse cracks in the cell wall, and from these the germ-tubes emerge.

Inoculation experiments made by Rees on pear trees showed *G. macrosporum* to be at least a wound parasite on this host, capable of considerable growth in apparently healthy bark during the dormant period of the tree, a fact which was confirmed by the histological study of the cankers on the apple observed more recently. In nature the fungus was not observed to produce a fruit rot, but when apples were artificially inoculated a soft, tan-coloured rot developed in every case, the causal organism being re-isolated from the lesions.

TEMPEL (W.). **Die Kräuselkrankheit des Pfirsichs (Exoascus deformans Berk.) und ihre Bekämpfung.** [The leaf curl disease of the Peach (*Exoascus deformans* Berk.) and its control.]—*Die Kranke Pflanze*, iv, 6, pp. 91–95, 1 fig., 1927.

Peach leaf curl caused by *Exoascus* [*Taphrina*] *deformans* is stated to have been exceptionally severe in 1927 in the peach-growing districts of Saxony, this outbreak being mainly attributed to the wet and cold weather which prevailed during the most susceptible stage of growth of the trees. Observations on the varietal resistance of the peach to the disease indicated that, generally speaking, late varieties were more susceptible than the early-maturing. The paper terminates with the usual recommendations for the control of the disease.

FISH (S.). **Brown rot of Peaches.**—*Journ. Dept. Agric. Victoria*, xxv, 7, pp. 409–411, 1 fig., 1927.

A brief, popular description is given of the symptoms and life-history of the causal organism of brown rot of peaches (*Sclerotinia cinerea*) [? *S. americana*: *R.A.M.*, vi, p. 619, which was first identified in the Goulburn Valley in 1921, since when it has spread throughout the district with remarkable rapidity. High humidity, caused by a combination of drizzling rain and warm weather, will induce suitable conditions for an outbreak of disease on the fruit in 24 hours. The fungus frequently develops in transit on fruit despatched to the Melbourne and Sydney markets. Good control of the disease may be obtained by the excision of infected twigs, the removal of mummies, and four applications of lime-sulphur: (1) just before the buds swell, 1 in 9; (2) at the pink bud stage, 1 in 35; (3) as the fruit begins to colour, 1 in 80; (4) and a month to three weeks before picking, 1 in 100.

FISH (S.) & HAMMOND (A. A.). **Shot-hole of Apricots. (Coryneum beijerinckii Oud.). Progress report on control experiments carried out during 1926 in the Goulburn Valley.**—*Journ. Dept. Agric. Victoria*, xxv, 7, pp. 403–408, 6 figs., 1927.

The results of experiments in the control of shot hole of apricots (*Coryneum beijerinckii*) [*R.A.M.*, vi, p. 624] conducted during 1926 indicate that the most efficacious treatment, in the Goulburn Valley,

Victoria, consists of two applications of standard Bordeaux mixture 6–4–40, one given at the dormant stage and the other at the pink bud stage. The cost of this treatment was estimated at *7d.* per tree. The use of half-strength Bordeaux mixture (6–4–80) or half-strength copper soda [Burgundy mixture] (6–8–80) during the spring was liable to produce blemishes on the fruit growing on the western side of the trees. One, two, or three applications of lime-sulphur (1 in 5, 1 in 25, and 1 in 40) failed to control shot hole effectively, and the third application was followed by serious damage to the leaves and fruit.

BERKELEY (G. H.). **Strawberry diseases.** [*ex* The Strawberry and its cultivation in Canada.]—*Canada Dept. of Agric. Bull.* 80, N.S., pp. 50–53, 1927.

Notes are given of the following diseases affecting Canadian strawberry crops. Leaf spot (*Mycosphaerella fragariae*) occurs in almost every plantation in certain districts, and if the spots are numerous, considerable damage may result. As a rule the Parson, Portia, Pocomoke, Lavinia, Splendid, and William Belt varieties are resistant. Where the plantations are only cropped once or twice (the usual modern practice) spraying is not often necessary, but in the case of three or more croppings, two or more applications of 4–4–40 Bordeaux mixture are recommended in addition to the usual sanitary measures.

Leaf scorch (*Diplocarpon earliana*) [*R.A.M.*, v, p. 616] is readily confused with the foregoing on account of the similarity of the lesions in the early stages. The measures recommended for the control of leaf spot are appropriate in this case also.

Powdery mildew (*Sphaerotheca humuli*) was severe in the Niagara Peninsula in 1923 and 1924. The William Belt, Parson, Portia, Glen Mary, and Dunlap varieties are normally resistant. Three applications of sulphur dust have been found to give good control where the disease is not amenable to ordinary cultural measures. Recent tests at the New York (Geneva) Agricultural Experiment Station have shown that even severe infection may be practically eliminated by four applications of 85-15 lime-copper dust, the first being given at the expansion of the first buds and the succeeding ones at twelve-day intervals.

Grey mould (*Botrytis* sp.) may be the cause of heavy losses among immature fruit in the Niagara Peninsula, especially in poor, weedy soils or during very rainy periods.

The most common and destructive rot of strawberries in transit and storage is known as 'leak' (*Rhizopus nigricans*) [ibid., vi, p. 240], which rapidly rots the fruit and disintegrates the tissues, with a resulting loss of juice. Careful handling and keeping the fruit at a temperature below 50° F. will greatly minimize the risk of infection.

Black root [ibid., v, p. 534], associated with *Fusarium* sp. and with unfavourable soil and cultural conditions, has been prevalent in Ontario of recent years. Control measures should be based on thorough sanitation and cultivation (including crop rotation), supplemented by applications of manure or nitrate of soda to stimulate growth.

ZELLER (S. M.). **A correction.**—*Mycologia*, xix, 3, pp. 150–151, 1927.

With reference to his paper describing the disease of raspberry caused by *Coryneum ruborum* in Oregon [*R.A.M.*, iv, p. 489] the author states that, following Archer's paper on the morphological characters of some Sphaeropsidales [*Ann. Myc.*, xxiv, pp. 1–84, 1926], he entirely concurs in the latter's view of the complete agreement between the description of *C. ruborum* and the herbarium material and cultures of *Hendersonia rubi*. He therefore considers that the ascogenous stage of the fungus described by him should be given Westendorp's specific name and that the new combination should be *Ascospora rubi* (Westend.) Zeller instead of *A. ruborum* (Oud.) Zeller.

ZELLER (S. M.). **Contribution to our knowledge of Oregon fungi. II. Mycological notes for 1925.**—*Mycologia*, xix, 3, pp. 130–143, 4 figs., 1927.

In this second series of notes on Oregon fungi the author presents a list of fungi not hitherto reported from that State or concerning which information of interest was obtained. The following deserve special mention.

Gnomonia rubi was found in a non-parasitic condition on dead canes of red and black raspberry and loganberry, this being the first record of the organism from the western United States. The fungus has perithecia 200 to 240 by 160 to 200 μ in diameter; asci 4-spored, 50 by 6 to 9 μ; and uniseptate spores, 12 to 16 by 2·5 to 4 μ. In one case the acervuli of a *Myxosporium* were associated with the perithecia. *Leptosphaeria thomasiana* was observed on dead loganberry canes; it causes the appearance on the canes of grey patches dotted with black, erumpent perithecia in their centre and pycnidia of a species of *Phoma* towards their margins; this association of the two forms is almost constant, but a genetic connexion between them has not yet been demonstrated. In western Washington a blight of raspberry canes caused by *L. thomasiana* has been ascribed to the fungus *L. coniothyrium*, although the latter species was never found by the author in its ascogenous stage in western Oregon or Washington, while the imperfect stage (*Coniothyrium fuckelii*) was occasionally found on dead canes of red and black raspberries. A description is given of a new species of *Exoascus* [*Taphrina*] (*E. pruni-subcordatae*) which was observed on immature fruits of the Sierra plum (*Prunus subcordata*), causing plum pockets, in Oregon and California. Its asci are clavate, often truncate, 8-spored, 54 to 61 by 10 to 13 μ; the spores are ellipsoid to ovate, hyaline, 6 to 10 by 3·5 to 5 μ, often forming conidia in the asci. The fungus apparently does not infect cultivated varieties of plums growing in the vicinity of the infected wild host, this specialization and the larger dimensions of its spores being the chief features that differentiate it from *T. longipes* and *T. communis*.

KARTHAUS (J. P.). **Het afsterven van stengels en knoppen bij de roode Framboos.** [The die-back of stems and buds in the red Raspberry.]—Thesis, University of Utrecht (Hollandia-Drukkerij, Baarn), 55 pp., 1927.

A detailed account is given of the writer's investigations on the

etiology of the die-back of the canes and buds of red raspberries (*Rubus idaeus*), which is stated to be very widespread in the vicinity of Breda, Baarn, Apeldoorn, and other districts of Holland.

The brown spots produced by *Didymella applanata* [*R.A.M.*, ii, p. 128] on raspberry canes in July become covered during August by the minute, black pycnidia of a species of *Phoma* apparently distinct from *P. idaei*, previously believed to be genetically connected with this ascigerous stage. These pycnidia measure 139 to 148 μ in diameter and contain pycnospores 6 by 2·5 μ in size; on cherry agar the fungus produces a flocculent mycelium which in turn gives rise to pycnospores of the *Cytosporella* type, but no ascospores.

The perithecia which develop towards the autumn on the *Didymella* spots were found to contain paraphyses only in immature fructifications, and it is suggested that this apparent absence of paraphyses has led to confusion between *D. applanata* and *Mycosphaerella rubina*, the imperfect stage of which is also a *Phoma* (*Phytopath.*, xiii, p. 44, 1923).

Inoculation experiments on one-year-old canes showed that the destructive action of the fungus is extremely slow, extending in one case over a full year. The death of the buds on infected canes is thought to be very probably also due to *D. applanata*, though no actual connexion was traced.

The perithecia ripen at the beginning of April, and thus the young shoots developing at the end of the same month are at once exposed to infection both from asco- and pycnospores, though the first symptoms of infection do not appear till July.

Control measures should be based on the prevention of infection of the young shoots. Bordeaux mixture or lime-sulphur should be applied, in the Baarn district, (*a*) during the early part of June; (*b*) a few days before picking, which takes place about the middle of July; and (*c*) immediately after picking, together with the removal of the two-year-old shoots.

Coniothyrium fuckelii [*R.A.M.*, i, p. 297] has been observed on living and dead canes at Apeldoorn and Breda. The reddish coloration of the spots does not appear to be a constant character in Holland, where the greyish lesions are liable to confusion with those produced by *D. applanata*. Inoculations resulted in the development of the symptoms of infection in six weeks in one case, others also succumbing in comparatively short periods.

The spores of *C. fuckelii* are stated to differ slightly from Saccardo's description, being oval instead of circular, and measuring 3·7 by 2·6 μ. The ascigerous stage of the fungus, *Leptosphaeria coniothyrium*, does not appear to occur on raspberry canes in Holland [see also last abstract]. Pycnidia with viable pycnospores were found on a two-year-old cane left for a year in the open. These provide a constant source of infection throughout the year, though conditions may not always permit of actual penetration of the tissues.

Gloeosporium venetum attacks the stems, leaves, petioles, fruiting canes, and fruit stalks. On one-year-old canes the fungus produces sunken, oval, greyish-white, water soaked spots, about 1 mm. across, with a reddish-brown to purple margin. The deep

wounds which frequently accompany infection give ready access to other parasites. At Apeldoorn the first symptoms occur about the middle of May, and primary infection of the young shoots is apparently caused exclusively by conidia developing from overwintered mycelium. The ascigerous stage, *Plectodiscella veneta* [ibid., iii, p. 589], has not yet been found in Holland. The first application of lime-sulphur for the control of anthracnose should be given when the leaves begin to unfold, at a strength of 1 in 10, and the second a week before the blossoming period at 1 in 40.

A so-called callus disease, characterized by the development, apparently exclusively on two-year-old canes, of brown, fleshy (later woody) excrescences, was observed near Breda in the summer of 1926. The disease is believed to be crown gall, caused by *Bacterium tumefaciens*.

A species of *Verticillium* resembling *V. dahliae* [ibid., v, p. 564; vi, p. 172] was isolated from canes showing an irregular yellow discoloration of the leaves, and a brown spotting and a gumming of the xylem at its juncture with the medulla. The fungus is believed to enter the plant through the underground organs and the old stumps of cut canes, progressing upwards from the medulla of the rootstock to that of the stem, and thence to the vascular bundles. This *Verticillium* is regarded as being probably one of the causes of die-back, but no inoculation experiments were undertaken. The Superlative variety showed remarkable resistance.

Elongated, brownish-green (later grey) lesions were formed in August, 1926, on raspberry canes at Baarn by *Botrytis cinerea*, which also caused a brown discoloration of the phelloderm, phloem, and cambium. The affected canes had been sprayed with lime-sulphur about six weeks before the injury was observed, and it is thought that the fungus acted as a facultative parasite on tissues weakened by the action of the fungicide.

The pycnidia of *Hendersonia rubi* (*Coryneum ruborum*) [see above, p. 738] were found on grey spots on a Hornet cane early in February, 1926. An inoculation experiment with the fungus gave negative results, and it is therefore regarded as probably non-parasitic.

Mosaic disease, which is stated to be very widespread in the Breda raspberry plantations, is believed to be largely concerned in the predisposition of the canes to infection by various parasitic fungi. A destructive virus disease, characterized by the production of low-growing, slender canes with small, curled leaves, has been observed in the vicinity of Breda on the Haagsche Bruine variety.

SIBILIA (C.). **Azione dell' acido cianidrico sull' accrescimento dei funghi.** [The action of hydrocyanic acid gas on the growth of fungi.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 2, pp. 202–212, 2 figs., 1927.

After summarizing the investigations of Stoklasa and of Jungmann on the effects of varying concentrations of hydrocyanic acid gas on fungi, the author describes experiments made by him to ascertain the behaviour of several fungi when exposed to concentrations such as those used in disinfection processes [against

insects]. Cultures of fungi on acid carrot agar, lightly stoppered with cotton wool, were exposed, for periods of from sixty to ninety-five minutes to concentrations of the gas ranging from 0·33 to 2·50 gm. per cu. m. The cultures and controls were then placed in a thermostat.

Temporary arrest or retardation of growth only was observed in the following fungi: *Alternaria tenuis, Gloeosporium cyclaminis, Pachybasium amatum, Mastigosporium lupini, Fusarium* sp., *F. subulatum, Penicillium glaucum, Mucor mucedo, Cladosporium herbarum, Dematophora* [*Rosellinia*] *necatrix*, and *Phytophthora infestans*. This effect the author attributes to the retention of part of the acid by the nutritive medium on which the fungi were grown. The spores of *Mastigosporium lupini* were, however, killed after one hour's exposure to hydrocyanic acid gas at 2·50 gm. per cu. m. Exposure for ninety-five minutes to a concentration of 1·45 gm. of the gas per cu. m. resulted after six days in the death of the mycelium of *Microcera coccophila*. *Fusarium subulatum*, on the other hand, when subjected to the same treatment resumed its normal growth six days after exposure, while after from twelve to fifteen days all the other fungi showed the same development as the controls, except that the production of acervuli in the case of *Gloeosporium* was very much delayed.

Hydrocyanic acid gas does not appear to act directly on the fungus, or if any such action does occur it is not appreciable at the concentrations ordinarily used in disinfection work. No injury was caused to the fungal vegetation itself, not the least sign of plasmolysis being observed.

FERDINANDSEN (C.). **Almindelige Synspunkter ved Bekaempelse af Plantesygdomme.** [General aspects of the control of plant diseases.]—*Ugeskr. for Landmaend*, lxxii, 25, pp. 385–389, 1927.

In this lecture the writer briefly outlines the history of plant protection from the earliest times to the present day, and discusses its application under the following headings: (1) exclusion of diseases; (2) eradication of diseases by means of seed selection, destruction of diseased material in orchards and gardens, rotation of crops and eradication of alternate hosts, and soil and seed disinfection; and (3) defensive measures based on plant hygiene, protective sprays, and the use of immune varieties.

PETRI (L.). **La terapia interna nella patologia vegetale.** [Internal therapy in plant pathology.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 2, pp. 101–120, 1927.

The author reviews the literature on the curative value of fungicidal injections in the control of plant diseases under the following headings, according to the different methods employed by the various investigators: (1) introduction of substances directly into the woody tissues of the stem; (2) absorption of solutions through the cut ends of roots or branches; and (3) absorption through uninjured roots and branches. Numerous experiments by various investigators are briefly described, a large proportion of the results

being negative, although in some cases positive results were obtained.

In the two first methods the chief danger appears to lie in the frequently severe alterations occurring in the parenchymatous tissues following the injection. The majority of substances used as insecticides and fungicides are toxic not only to the parasite concerned but also to the plant itself, when a certain limit of concentration is exceeded. The effects may be evident in the partial or total desiccation and falling of the leaves, or an introduction of soluble solid substances into the vascular tissue may result in gumming, with a consequent obstruction to the further progress of the disinfectant. The second method should, however, prove valuable in the study of the etiology of certain non-parasitic diseases closely connected with plant nutrition. It is, for example, being adopted at the present time in studying the [non-parasitic] silver leaf disease on peach trees in Italy [*R.A.M.*, vi, p. 395].

Of the three methods described, the root absorption process appears to lend itself most favourably to future developments. Reference is made to certain preliminary experiments which have been recently carried out with a view to defining the action of various substances on the activities of the living cytoplasm. The fact that varieties of the same species show different grades of resistance in regard to the same parasite suggests that the action of substances adapted to absorption by the root may result in a clearer differentiation between the varying physiological properties of the races of certain cultivated plants.

American Type Culture Collection. Catalogue of cultures 1927. —96 pp., Waverley Press, Inc., Baltimore, 1927.

Most of the entries in this catalogue of the American Type Culture Collection, John McCormick Institute for Infectious Diseases, 637 South Wood Street, Chicago, Ill., consist of bacteria, actinomycetes, yeasts, and moulds. A number of other fungi are included and the genus *Phytophthora* is well represented with 16 species. Cultures are furnished to institutions for purposes of research and the like, at a charge of $1 per culture with additions for packing and postage.

GADD (C. H.). **Root diseases of economic crops. A reply to Dr. W. Small.**—*Trop. Agriculturist*, lxviii, 6, pp. 363–370, 1927.

In this paper the author subjects to severe criticism the hypothesis propounded by Small that root disease of economic crops in Ceylon, and probably also elsewhere, is due primarily to the parasitic activity of *Rhizoctonia bataticola* [*R.A.M.*, vi, p. 629]. He considers it would be most inadvisable for growers to discontinue the vigorous prosecution of the measures now in vogue for the control of the root diseases of plants.

SMALL (W.). **Rhizoctonia bataticola and root disease. A reply to Dr. C. H. Gadd's criticism of my views.**—*Trop. Agriculturist*, lxviii, 6, pp. 370–381, 1927.

In replying to Gadd's criticism of his views [see above abstract], the author states that he remains unconvinced by his opponent's

reasonings and deductions, and sees no good reason yet to depart from his position in regard to the primary part played by *Rhizoctonia bataticola* in the causation of root disease of economic crops in Ceylon.

RAYNER (Miss M. C.). **Mycorrhiza. An account of non-pathogenic infection by fungi in vascular plants and Bryophytes.**—*New Phytologist Reprint* 15, vi + 246 pp., 7 pl., 20 figs., London, Wheldon & Wesley, 1927.

This volume gives, in great detail, an historical and critical review of the investigations which have been carried out on mycorrhiza from the commencement of the study of the subject up to the present day. The author treats the subject in three periods, the first, prior to 1880, characterized by the mere accumulation of facts, the full significance of which was not appreciated; the second, 1881–1900, one of observation and speculation largely dominated by the work of Frank; and, thirdly, the modern period, marked by the application of modern methods of research to the problems presented by mycorrhiza. Separate chapters are devoted to the mycorrhiza of orchids, of Ericaceae, of trees, of Bryophyta and Pteridophyta, ectotrophic mycorrhiza, tuberization, and the physiology and nutrition of mycorrhiza. 'In the opinion of the writer, there can be no doubt that recent investigations by means of pure cultures have tended to support the view that the possession of mycorrhiza is frequently of benefit to the vascular hosts, the nature and extent of such benefit depending upon the physical conditions of the environment and the physiology of the association in individual cases.' The work is provided with a full bibliography extending to 21 pages.

[This book is reprinted from a series of papers which appeared in the following issues of the *New Phytologist*—xxv, 1, pp. 65–108; 3, pp. 171–190; 4, pp. 248–263; 5, pp. 338–372, 1926; and xxvi, 1, pp. 22–45; 2, pp. 85–114, 1927.]

WOLFF (H.). **Zur Physiologie des Wurzelpilzes von Neottia nidus-avis Rich. und einigen grünen Orchideen.** [On the physiology of the root fungus of *Neottia nidus-avis* Rich. and some green Orchidaceae.]—*Jahrb. wissensch. Bot.*, lxvi, 1, pp. 1–34, 11 figs., 1 diag., 1926.

During the period 1922–6 the writer carried out a series of investigations on the physiology of the root fungus of *Neottia nidus-avis* at the University of Basle.

The fungus was isolated from sterilized roots and grew well in water cultures and Knop's solution. The mycelium remains almost completely submerged, aerial hyphae and spore chains seldom rising to the surface. The fungi studied by Burgeff from *Gymnadenia conopea, Orchis maculatus, Helleborine palustris*, and *H. latifolia* were similarly cultured.

The mycelia of all the above-mentioned root fungi are differentiated into long and short hyphae, the latter usually segmenting into conidial chains, which, however, do not fall asunder. Hence the newly cultivated mycorrhiza of *N. nidus-avis, H. palustris*, and *H. latifolia* belong to Burgeff's genus *Orcheomyces* (= *Rhizoctonia*

Bernard: *Ann. Sci. Nat. Bot.*, Sér. 9, ix, p. 1, 1909), and are accordingly designated *O. neottiae*, *O. helleborines palustris*, and *O. h. latifoliae*, respectively.

O. neottiae is aerobic and prefers acid media with a hydrogen-ion concentration of P_H 3·3 to 5·2. In pure culture the fungus utilizes mainly glucosides (e. g., tannin), polysaccharides, hexoses, pentoses, and pentosans (e. g., gum arabic). The inorganic nitrogen compounds assimilated by the fungus are potassium nitrate and ammonium sulphate, while the organic nitrogen compounds utilized include glycocol, haemoglobin, and the albumin present in salep. Its capacity for the fixation of atmospheric nitrogen was quantitatively demonstrated, and the addition of nitrogen compounds to the medium did not modify this capacity. *O. conopeae* (isolated from *G. conopea*), *O. maculati* (from *Orchis maculatus*), *O. helleborines palustris*, and *O. h. latifoliae* are also able to fix atmospheric nitrogen.

The metabolic product of all the fungi under investigation was glycogen in young cultures and a fatty oil in old ones.

The orchid mycorrhizal fungi investigated by the author were further shown to be capable of splitting and assimilating reducing sugars from the high molecular compounds present in humus soils (pentosans and glucosides, such as tannin). The green orchids, e. g., *O. maculatus*, *G. conopea*, *H. palustris*, and *H. latifolia* appear to utilize by means of their mycorrhiza only combined nitrogen, which enables them to flourish in soils deficient in inorganic salts. *Neottia*, on the other hand, is also supplied with reducing sugars by its mycorrhiza, thereby effecting a partial decrease in its needs for carbonic acid assimilation, accompanied by an abundant starch formation. The dependence of the orchids on their mycorrhiza appears to culminate in such species as *Corallorrhiza* and *Epipogon*, which are virtually without chlorophyll. *N. nidus-avis* probably occupies an intermediate position between the colourless and the green orchids, the latter belonging, by reason of their nutrition relations, to the same biological group as the Leguminosae, the genera *Pavetta* and *Ardisia*, and the Ericaceae.

BAUCH (R.). **Rassenunterschiede und sekundäre Geschlechtsmerkmale beim Antherenbrand.** [Strain differences and secondary sexual characters in anther smut.]—*Biol. Zentralbl.*, xlvii, 6, pp. 370–383, 3 figs., 1927.

In certain crosses between strains of anther smut (*Ustilago violacea*) [*R.A.M.*, vi, p. 308] the conjugated sporidia give rise to germ-tubes, whereas in others they undergo no change. The germ-tubes develop only in crosses between strains, not in combinations of the two sexes of one strain. They occur constantly in crosses of the fungus from *Dianthus deltoides* with the strains from *Melandrium album* and *Malachium aquaticum*, and probably also with that from *Silene chlorantha*.

The form on *M. album* was found to react differently in crosses with the strain from *Saponaria ocymoides* according to its habitat. Biologic specialization, which is thus evidently subject to geographical variations, does not, in the author's opinion, form a suitable basis for the establishment of new species.

SEUBERT (ELISABETH). **Ueber Keimschädigungen der Erstling durch Virus-Netznekrose.** [On sprout injuries to early Potatoes from virus net necrosis.]—*Die Kartoffel*, vii, 11, pp. 131–132, 2 figs., 1927.

The recent examination of samples of Schotsche Muis [Midlothian Early] potatoes at a large Rhenish depot showed that the tubers were consistently affected by net necrosis [*R.A.M.*, vi, p. 311], which has hitherto scarcely been observed in Germany. The symptoms of this disease [which are briefly described] can only be detected by cutting open the tubers, and they are not usually visible until the potatoes have been stored for some months. Hence growers have no guarantee that even certified material is free from infection, and the use of German early varieties, none of which is so far known to be affected, is recommended. A short note is also given on sprain [ibid., vi, p. 179], with which the symptoms of net necrosis may be confused at a casual inspection.

KOLTERMANN (ALWIN). **Die Keimung der Kartoffelknolle und ihre Beeinflussung durch Krankheiten.** [The germination of the Potato tuber and its response to the influence of diseases.]—*Angew. Bot.*, ix, 3, pp. 289–339, 10 figs., 1927.

The work of previous investigators on the effect of various potato tuber diseases on germination is summarized. The author also carried out a series of tests of the effect on germination of certain diseases that cannot be detected in the tubers.

A black discoloration resulting in the death of the sprout tips was found to be due to external factors, chiefly humidity. Preliminary observations denote that this phenomenon has no adverse effect on the value of the tubers for planting purposes, since it has only been observed in germinating tests and not in the field.

Filosité [*R.A.M.*, vi, p. 435] was also shown to be caused by unfavourable external conditions, such as unsuitable sites of cultivation, over-heating of the storage atmosphere, and the like. Tubers affected by filosité never produced plants showing symptoms of any definite disease but only those of the so-called 'kümmerer' (dwarfing) type [ibid., iv, p. 149]. Conversely, the tubers from plants showing symptoms of disease in the above ground parts were not found to develop filosité.

The production of pea- to walnut-sized tubers close to the mother tuber was in no case found to be due to virus diseases. It may, however, be caused by excessively warm storage and by frequent removal of the sprouts. The failure of germination in these experiments could also not be ascribed to the influence of definite diseases.

No influence of leaf roll on germination could be detected. The tubers from diseased plants formed vigorous as well as feeble sprouts [ibid., vi, p. 634], while leaf roll plants developed from both diseased and healthy tubers. Similar observations were made in connexion with mosaic disease.

Severe leaf curl caused serious damage to germination, the sprouts produced by affected tubers being thick but short and deformed.

JACZEWSKI (A. A.). Ведьмины метлы Картофеля. [Witches' brooms of the Potato.]—Reprinted from *Материалы по Микол. и Фитопат. России* [*Matters concerning Mycol. and Phytopath. in Russia*], v, 2, 12 pp., 3 figs., 1926. [Received October, 1927.]

After giving a detailed description of witches' broom of the potato as observed by him and some of his collaborators in Russia, the author points out that the symptoms coincide fairly closely with those described as secondary manifestations of this disease in America by Hungerford and Dana [*R.A.M.*, iv, p. 55]. The main points of difference are that in Russia the plants affected have never been observed to flower or to fruit, and that they produce very few, if any, tubers, those which form remaining very small, hardly the size of green peas. The stunted and chlorotic condition of the foliage noted in America is not a constant feature of the disease in Russia, and the author believes that it may be due to some subsidiary infection, the more so since for the most part the foliage has a healthy colour, and is of a normal shape and size, with the exception that the stalks are always round instead of quadrangular in cross section. Aerial tubers have not been seen in association with the disease in Russia up to the present time. So far, the trouble is only of sporadic incidence, and is most prominent on varieties imported from abroad, only very few cases having been found on home-bred varieties.

Another type of witches' broom has been long known to potato growers in the neighbourhood of Moscow under the name of 'koudriash' [curly head]. In contradistinction to that described above, it chiefly attacks home varieties, and has very definite and apparently constant morphological features. The diseased plants have a stunted growth; the stems remain very slender, sometimes filiform, and soft; they are profusely branched, and never produce flowers; the leaves either remain entire or only have one or two pairs of pinnae, the apical one being generally joined with one of the laterals and greatly increased in size. There is a tendency of the plants to produce a larger number of tubers than normal, and the tubers are usually more elongated than healthy ones, thus approaching to the type of spindling tubers. The yield of the diseased plants is adversely affected. Some observations indicate that these symptoms may become attentuated or even disappear as the plant grows older, and preliminary experiments show that tubers from diseased hills may produce entirely normal plants. The author considers this trouble to be a mild form of witches' broom.

In conclusion, the author states that in 1926 he observed for the first time in Russia a case of 'giant hill' [ibid., v, pp. 179, 292] raised from a tuber of the Reitan variety originating from a line which was known to be affected with mottled mosaic for the three previous years.

The maintenance of pure and vigorous stocks of varieties of the Potato.—*Board of Agric. Scotland, Misc. Publ.* 3 (Revised ed., 1927), 106 pp., 7 pl. (1 col.), 1927.

The section of this publication (pp. 95–103) which deals with the

prevention of loss consequent on disease and mishandling of potato stocks includes descriptions in popular terms of the following diseases: leaf roll, ordinary mosaic, crinkle, aucuba mosaic, stipple streak (or leaf drop streak), corky scab [*Spongospora subterranea*], and blackleg [*Bacillus atrosepticus*]. Growers are advised to familiarize themselves with typical, healthy specimens of the variety with which they are dealing, in order that disease may be the more readily detected; the planting of healthy stock is urged in all cases.

The following varieties are cited as relatively resistant to blight (*Phytophthora infestans*): Arran Consul, Evergood, Rhoderick Dhu, President, Lochar, Irish Queen, Kerr's Pink, Champion, Irish Chieftain, Langworthy, Golden Wonder, Arran Victory.

Growers in districts where degeneration (virus) diseases prevail are recommended to obtain stock from a hilly or northern area, where insect carriers do not thrive; while growers in hilly or northern areas are advised, if insect carriers are not common, simply to multiply a healthy stock, roguing out degenerate plants; this policy is likely to succeed best in very late, humid districts. Should insect carriers occur, healthy plants should be selected from a late district, and the produce of each plant should be planted out separately in groups per plant, preferably in a root crop, at least ten yards being left between each two groups. Seed stock should be built up only from groups free from disease, and should be examined periodically during the growing season; diseased plants must be removed.

Careful digging and storage are also important; potatoes should be stored at a temperature between 36° and 40° F.

RASMUSSEN (L.). **Bekæmp Kartoffelskimmel.** [Control the Potato fungus.]—*Ugeskr. for Landmænd*, lxxii, 26, pp. 401–402, 1927.

The exceptionally poor potato harvest of 1926 in Denmark (199 compared with an average of 290 hectokg. per hect.) is attributed mainly to the early and severe attacks of blight [*Phytophthora infestans*], control measures against which were greatly neglected. The average increase of yield obtained in about 100 spraying experiments carried out during the last twenty years was about 30 hectokg. per hect. (representing a value of approximately Kr. 200 per hect.) for an application of 2 per cent. Bordeaux mixture. Of the many substitutes for this spray now on the market, the most satisfactory is stated to be pota dust [I. H. Grabow & Co., Horsens], consisting of ground copper sulphate with an admixture of a neutral substance. The dust should be applied at the rate of 150 to 200 kg. per hect. during the very early hours (3 to 4 a.m.), while the dew is still on the plants. The efficacy of pota, however, is not equal to that of Bordeaux mixture.

RAYLLO (A. I.). Опыты и наблюдения над **Hypochnus solani** на Картофеле. [Experiments and observations on *Hypochnus solani* disease of the Potato.]—Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, p. 203, 1927.

The experiments briefly described in this paper were planned to establish the effect of artificial infection with *Hypochnus* [*Corticium*]

solani on the development of the potato, the inoculations being made (*a*) on unwounded tubers before planting, (*b*) through slight wounds on the shoots before planting, and (*c*) after the appearance of the shoots above the soil. The results indicated that the parasite delayed the appearance of the shoots above the surface of the soil. The fungus was observed to attack the growing points of the sprouts, and in severe cases the shoots were destroyed completely. The further development of infected plants varied with the different varieties tested, some varieties such as Wohltmann, Evergood, Kanzler, Silesia, and Magnum Bonum, showing practically no diminution in their vegetative vigour, while others, such as Znitsh, Sechswochige, and Gratia, were visibly depressed during the whole of their growth. Yields were greatly affected in all cases, but most in (*b*), where the reduction ranged from 36 to 82 per cent., and differences in the behaviour of varieties in this respect were also noticed. No relationship could be established between the severity of infection of the tubers with that of the aerial parts.

Sclerotia were formed on the roots of the following plants: wheat, oats, buckwheat, maize, clover, carrot, radish, beet, tomato, sorrel [*Rumex*], hemp [*Cannabis*], cabbage, sunflower, tobacco, cucumber, and vegetable marrow, when they were inoculated with *C. solani*, while only mycelium was formed on lettuce, rye, French beans, and peas.

HARTER (L. L.) & WHITNEY (W. A.). **Mottle necrosis of Sweet Potatoes.**—*Journ. Agric. Res.*, xxxiv, 10, pp. 893–914, 3 figs., 3 graphs, 1927.

This paper is a report of the results obtained in the continued investigation of the mottle necrosis of sweet potatoes [*R.A.M.*, iv, p. 440]. The disease is stated to be increasing in economic importance in those states of North America where the more susceptible Yellow Jersey and Big Stem Jersey varieties of the crop are extensively grown, but in view of the environmental requirements of the causal organisms it is not believed that the trouble will ever become destructive in the southern states.

Mottle necrosis is primarily a field disease, and is found at digging time, a feature which distinguishes it from any of the other root diseases with the possible exception of soft rot (*Rhizopus nigricans*) [ibid., iv, p. 699]. Superficially, the disease may be quite inconspicuous, the surface lesions varying from small, dirty brown, somewhat sunken spots at the base of the small rootlets to large sunken spots of various sizes and shapes; there does not appear to exist any relationship between the size of the surface lesion and the amount of internal decay. Three types of decay are distinguished, namely, the marble type, the cheesy type, and the band type, the last being the least common. It was shown that any of these types could be produced by more than one of the organisms involved, the kind of decay depending largely on the atmospheric and soil conditions.

From the numerous inoculation experiments made with the various strains of *Pythium* isolated from affected sweet potatoes, two species, identified by Drechsler, were proved to be pathogenic. The first (which was isolated but a few times) is a new species

named by Drechsler *P. scleroteichum*, a description of which is stated to be forthcoming. The other is *P. ultimum*, and is the species most frequently met with; it was shown by the authors to cause a cottony leak of snap beans [*Phaseolus vulgaris*], when artificially inoculated, similar to that caused by *P. aphanidermatum* [ibid., v, p. 465]. Typical mottle necrosis of sweet potatoes was also produced in artificial inoculation experiments by the last-named species (which proved to be a virulent parasite on this host), and to a lesser extent by *P. splendens* from *Pelargonium* sp. and *P.* 5825 from pear.

The temperature relations of *P. ultimum*, *P. aphanidermatum*, and *P. scleroteichum* on maize-meal agar were established as follows: minimum, about 2°, 6°, and 8° C.; optimum, 30°, 32°, and 29°; and maximum, approximately 41·8°, 41·8°, and 38·5°, respectively. It was shown, however, that the optimum temperature for growth of the fungi in pure culture and the optimum temperature for rotting the tubers are quite dissimilar, as *P. ultimum* was found to produce the greatest amount of decay in a given time at temperatures between 12° and 15°.

The prevalence and destructiveness of the disease depends more or less on soil moisture and temperature, it being worst in medium light soils. It was shown that the organisms involved in mottle necrosis also cause a rootlet rot of sweet potatoes in the hotbed, with a cumulative effect from year to year, thus indicating the advisability of renewing the soil in the hotbed every year. Care should be taken not to water the plants in the hotbeds more than is actually necessary, as the organisms thrive best in soil containing a large amount of moisture. Crop rotation is also advised, as there was evidence that the fungi increased in the soil of fields used several years consecutively for the crop. While all the commercial varieties of sweet potatoes were infected artificially, only the Triumph, Yellow Jersey, and Big Stem Jersey have been found seriously affected in the field, and a number of good varieties [a list of which is given] appear to be more or less immune. Mottle necrosis was found not to be a storage trouble.

In conclusion, the authors briefly describe a rootlet rot of sweet potatoes similar to stem rot, but caused by *Rhizoctonia* [*Corticium*] *solani*. It differs in that the roots are more completely destroyed, and also in that clusters of small roots subsequently develop which resemble a witches' broom. This disease seems to be more prevalent on light sandy soils, and is in no way associated with mottle necrosis.

HARTER (L. L.) & WHITNEY (W. A.). **Relation of soil temperature and soil moisture to the infection of Sweet Potatoes by the stem-rot organisms.**—*Journ. Agric. Res.*, xxxiv, 5, pp. 435–441, 2 graphs, 1927.

Details are given of experiments conducted in the greenhouse to test the relation of soil temperature and moisture to infection of sweet potato with *Fusarium hyperoxysporum* and *F. batatatis*, the organisms responsible for the stem rot disease, the seasonal prevalence and severity of which appear to be particularly closely correlated with soil conditions [see also *R.A.M.*, v, p. 688]. The results

showed that the optimum temperature for infection lies about 30° C. and the maximum at about 35°; the minimum could only be approximated, since infection occurred at a temperature as low as that at which the host would grow. The determination of the effect of soil moisture content on infection presented some difficulties, and the authors point out that the data obtained by them do not give a real picture of the relationship; they showed, however, that infection occurs over a wide range of soil humidity. At 28 and 75 per cent. of the water-holding capacity of the soil 94 and 100 per cent., respectively, of the plants became diseased, while infection also took place in a soil containing only enough moisture to support plant growth. There was also evidence that wounding of the tubers is not necessary to infection, as a small percentage of sprouts arising from tubers dipped in a spore suspension of the causal organisms became infected; the percentage of infection was, however, greatly increased when the sprouts were pulled.

HARTER (L. L.) & WHITNEY (W. A.). **The comparative susceptibility of Sweet Potato varieties to stem rot.**—*Journ. Agric. Res.*, xxxiv, 10, pp. 915–919, 1 graph, 1927.

A brief account is given of field experiments conducted from 1922 to 1926 at Houston, Delaware, and for two consecutive years at Seaford, Delaware, to test the relative susceptibility of 21 named varieties of sweet potatoes to the stem rot caused by *Fusarium batatatis* and *F. hyperoxysporum* [*R.A.M.*, v, p. 579]. All the tests were made in naturally infected soil, the severity of the test being increased at Houston by dipping the roots of the plants used in a spore suspension at the causal organisms just before planting. The results, which were markedly similar at the two stations, indicated that no variety is entirely immune from the disease, but some, such as Creola, Dahomey, Haiti, Key West, Pierson, Pumpkin, Red Brazil, Southern Queen, Triumph, White Yam, and Yellow Strasburg exhibited such slight injury as to warrant the belief that they could produce a normal crop even when grown in badly infected soil. The Big Stem Jersey, Georgia, Gold Skin, Nancy Hall, Porto Rico, Red Jersey, and Yellow Jersey varieties proved to be highly susceptible.

BATESON (E.). **Rubber in North Borneo. Annual Report of the Mycologist and Agricultural Adviser for 1926.**—*Bull. Rubber Growers' Assoc.*, ix, 8, pp. 511–513, 1927.

During the drought which marked the first half of 1926, claret canker [*Phytophthora faberi*], black thread [*P.* sp.], and pink disease [*Corticium salmonicolor*] were comparatively uncommon, but in the wet weather which followed, these diseases multiplied on a few estates.

Since daily tapping was abandoned, brown bast has been less prevalent than formerly.

Fomes lignosus was observed on trees fifteen or sixteen years old; occasionally, groups of fifty trees were attacked, the disease having spread from an infected tree in the centre. Many young clearings were also affected. *Ustulina zonata* and *F. pseudoferreus* are still comparatively uncommon.

De Vries (O.). **Beschimmelen van Rubber.** [Mould on Rubber.] —*Arch. voor Rubbercult.*, xi, 7, pp. 262–283, 1927. [English summary.]

The results of an extensive series of experiments [which are tabulated and discussed] have shown that the properties of rubber (viscosity, tensile strength, plasticity, and the like) are not affected by the superficial development of moulds (*Penicillium* and *Aspergillus* spp.) for periods up to five years. After this time a decided deterioration in all respects was observed. There was, however, a noticeable decrease in the weight of mouldy smoked and unsmoked sheet rubber (mainly resulting from the loss of volatile products produced by decomposition in the rubber), ranging from 4 per cent. after forty days to 31 per cent. after five years. These investigations are considered to show that the presence of moulds on crepe rubber for short periods is of no practical importance.

[A summary of this paper appeared in *Planters' Chron.*, xxii, 32, pp. 458–460; 33, pp. 468–469, 1927 and in *Malayan Tin and Rubber Journ.*, xvi, 17, pp. 1041–1043, 1927.]

Salmon (E. S.). **Tenth report on the trial of new varieties of Hops, 1926.**—*East Malling Res. Stat., Kent*, 34 pp., 1927.

A severe attack of mosaic disease occurred in 1926 in the experimental gardens of East Malling Research Station [*R.A.M.*, vi, p. 52]. As in previous seasons, the Golding varieties were attacked with virulence. No mosaic was observed in the Fuggles variety, or in those new varieties which had proved immune in previous seasons, even though these were growing on either side of a Golding variety suffering severely from mosaic. Proof was obtained [ibid., vi, p. 690] that mosaic disease of the hop is a virus disease, and that the M. 45 variety is a carrier. It is thought that the virus may be transmitted by the knife, and communicated to a healthy plant in cutting; sterilization of the knife may therefore prove of importance in arresting the spread of the disease.

An account is also given of the situation in the test plots during 1926 as regards downy mildew [*Pseudoperonospora humuli*: ibid., vi, pp. 690–694]; it was found that the cones of a variety may be severely attacked without any disease appearing on the bine, and conversely, that an attack on the bine does not necessarily imply any subsequent appearance of disease on the cones. Hence, it is considered that varieties of hops may be found, or bred, which will prove truly resistant, at least as regards their cones, to downy mildew.

Sgd (G.). **Ausbreitung des Hopfenbaues und der Peronosporakrankheit.** [Extension of Hop cultivation and of the *Peronospora* disease.]—*Wiener Landw. Zeit.*, lxxvii, 23, pp. 208–209, 1927.

Commenting on the general extension of the area under hops, especially in the Pressburg district (Czecho-Slovakia) and in the Woiwodina (Jugo-Slavia), the writer fears a corresponding increase in the incidence of downy mildew [*Pseudoperonospora humuli*: see last abstract]. This serious disease, which devastated the Bavarian hop gardens to the extent of 60 per cent. of the crop in 1926, has

now appeared in the hitherto healthy Saaz district, while in the Woiwodina young, as well as old, plantations are attacked.

CHARDON (C. E.). **Revolution of Sugar-Cane varieties in Porto Rico.**—*Planter and Sugar Manufacturer*, lxxviii, 22, pp. 429–430; 23, pp. 451–453, 466, 1927.

These two articles are a slightly abridged translation of the author's paper already noticed from another source [*R.A.M.*, vi, p. 581].

RANDS (R. D.) & SHERWOOD (S. F.). **Yield tests of disease-resistant Sugar-canes in Louisiana.**—*U.S. Dept. of Agric. Circ.* 418, 20 pp., 2 figs., 1927.

This report summarizes the results obtained from comparative plot tests conducted during 1925–6 to investigate the yield of certain varieties of sugar-cane imported into Louisiana to replace the widely grown Louisiana Purple and Louisiana Striped (Ribbon) varieties, which have recently proved highly susceptible to mosaic.

On heavy soil, the outstanding variety was P.O.J. 213, which yielded from 500 to 1,200 lb. of sugar per acre more than any other variety tested: on light soil the yield was only approximately equal to that of P.O.J. 234, owing, perhaps, to severe injury caused by the borer [*Diatraea saccharalis*]. Both these varieties gave a bigger yield than P.O.J. 36 and 826, partly because, in all tests, these were handicapped by their naturally later ripening, combined with an early harvesting. In a test made on a third type of soil, near Lafayette, in a region where fair yields are still obtained from the old varieties, P.O.J. 213 and P.O.J. 234 again gave the best results, yielding respectively, 300 lb. and 800 lb. of sugar per acre more than Louisiana Purple.

CRAWLEY (J. T.). **Control of the mosaic disease in Cuba.**—*Facts about Sugar*, xxii, 23, pp. 554–555, 1927.

The results of two years' observations on the control of mosaic disease of sugar-cane in Cuba are presented. A number of cases are cited in which careful seed selection and roguing proved entirely unreliable in the eradication of infection, and Alfaro's method of autumn planting [*R.A.M.*, v, p. 329] is recommended as the only practicable means of control. A great improvement in the disease situation has already been effected by the adoption of this method, the incidence of infection being negligible among autumn-planted canes even where insect vectors [*Aphis maidis*] have free access to the fields.

COOK (M. T.). **Experiencias con la gomosis de la Caña de Azúcar.** [Experiments on the gumming disease of Sugar-cane.]—*Rev. de Agric. Puerto Rico*, xviii, 5, p. 281, 1927.

The author states that a considerable decrease in the incidence of the sugar-cane gumming disease [*Bacterium vascularum*] has been noticed in the plantations of Porto Rico, where the very susceptible Cristalina and Rayada varieties have been replaced by the varieties B.H. 10 (12) and S.C. 12 (4). In a table are given the results of the first year of a series of experiments carried out under

very severe conditions to test the resistance to the disease of a number of varieties, eight of which remained free from infection, and seven showed less than 1 per cent. diseased. The experiments will be continued for two further years in order to ascertain the effect of the disease on the ratoons.

Hawaii.—*Planter and Sugar Manufacturer*, lxxviii, 23, p. 463, 1927.

Eye spot of sugar-cane [*Helminthosporium sacchari*: *R.A.M.*, vi, p. 536] is reported to have been very severe on the windward side of the island of Kauai [Hawaiian Islands] during June, 1927. The disease is said to destroy almost entirely the growth of young canes of susceptible varieties; in the ratoon stage, the plant does not suffer as severely as young cane, but in badly infected areas the entire field may develop top rot. Losses of 500 and 2,000 short tons of sugar are estimated by two companies for the current year while a third, which planted large areas of resistant varieties, is not seriously affected.

GUYOT (A. L.). **Quelques observations nouvelles sur les Ligniera radicicoles.** [New observations on root-inhabiting *Ligniera*.] —*Rev. Path. Vég. et Ent. Agric.*, xiv, 2, pp. 176–183, 3 figs., 1927.

After summarizing the work of Cook on *Ligniera* [*R.A.M.*, vi, p. 190], the author records a number of new hosts harbouring in their roots non-hypertrophying Plasmodiophoraceae of the *Ligniera* type.

Species of *Bromus* and *Festuca* collected during the spring of 1926 on sandy soil rich in humus revealed the presence of an organism resembling *L. verrucosa* recorded by Maire and Tison on *Veronica arvensis*, but with more numerous projections on the exospore. A species closely resembling *L. verrucosa* was also observed on roots of *Chenopodium album*, and the same fungus, or a form of it, was found in the roots of young plants of *Beta vulgaris* sown in pots in the garden of the Station de Pathologie Végétale in Paris. The author considers that all these fungi should be referred to *L. verrucosa*, which, like *L. junci*, should be regarded as a species including a group of closely related forms or host varieties. Viewed in this sense, *L. verrucosa* is a fairly common parasite, occurring on apparently healthy roots as well as on unhealthy ones, frequently in association with *Asterocystis radicis*.

Cook's suggestion, that *Sorolpidium betae* is merely an association of a *Ligniera* and *Asterocystis radicis*, is supported by the fact that by sowing seed of *B. vulgaris* in soil contaminated with *L. verrucosa* and *A. radicis*, a mixed infection by these two organisms was easily obtained.

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Hongos parásitos y saprofitos de la República Dominicana. (11ª Serie.).** [Parasitic and saprophytic fungi of the Dominican Republic. (11th Series.)]—*Bol. R. Soc. Española Hist. Nat.*, xxvii, 6, pp. 267–280, 15 figs., 1927.

In the 11th series of the authors' descriptions of Dominican fungi

[*R.A.M.*, vi, p. 580] the following records are of interest. *Puccinia pruni-spinosae* was found on leaves of *Prunus spinosa*. *Dyctyothyriella mucosa* was observed on leaves of *Coffea robusta*. *Sphaerella cinnamomicola* n. sp. ad int., found on leaves of *Cinnamomum zeylanicum* in association with *Pestalozzia funerea*, *Phyllosticta cinnamomi*, and *Cytosporella cinnamomi*, is believed to cause the formation of large, irregular spots, up to 10 cm. in length, which lead to the premature shedding of the leaves. It has irregularly distributed, chiefly epiphyllous, globose, black perithecia up to 125 μ in diameter; ovoid or oblong asci up to 45 by 14 μ in diameter, pedicellate, without paraphyses; ascospores distichous or sub-distichous, hyaline, 1-septate, 10 by 5 μ. *Zignoella anoniicola* was found on living leaves of *Anona muricata* in association with *Pestalozzia conglomerata* n. f. *foliicola* and *Placosphaeria anonicola* n. sp. ad int. The latter forms on the leaves numerous large, reddish spots bearing a large number of dispersed, rounded or irregularly angular, dark fuliginous, epiphyllous stromata, which produce large numbers of hyaline, sub-fusoid, 1-septate spores, 5 to 7 by 1·5 to 2 μ in diameter, on very long, hyaline, filiform sporophores. *Phyllosticta libertiana* was recorded on leaves of *Viola odorata* in association with *Gloeosporium violae*, *Cercospora violae* n. f. *minima*, and *Phyllosticta violaecola* n. sp. ad int. The latter forms irregular or oblong, whitish spots, from 2 to 6 mm. in diameter, with a narrow, chestnut brown margin. Its pycnidia are epiphyllous, black, globose, 60 to 135 μ in diameter, with very numerous, hyaline, variously shaped spores, 9 to 11 by 5 to 6 μ in diameter, without visible sporophores. *Cercospora bixae* was found on living leaves of *Bixa orellana*. *Helminthosporium flagelloideum* was found in the island Beata on dry leaves of *Panicum maximum* in association with *Phyllosticta panici-maximi* and *Fusarium subulatum*. *Alternaria allii* was recorded on dry leaves of the onion (*Allium cepa*), *A. brassicae* on species of *Brassica*, and *Botrytis* [*Beauveria*] *bassiana* was observed parasitizing the larvae of *Bombyx mori* in Moca. *Gonatobotrys blighiae* n. sp. ad int. was found forming pale, effuse spots on living leaves of *Blighia sapida*; it has hyaline, ovate-oblong conidia, 4·5 to 6 by 2·5 to 3 μ, tapering at the base, and borne on lateral, short, erect conidiophores.

TEHON (L. R.) & DANIELS (EVE Y.). **Notes on the parasitic fungi of Illinois. III.**—*Mycologia*, xix, 3, pp. 110–129, 1 pl., 1927.

The present, third series of notes on the parasitic fungi recorded in Illinois [*R.A.M.*, v, p. 251] contains the following new species of phytopathological interest.

Phyllosticta porteri forms irregularly circular spots from 2 to 10 mm. in diameter, frequently coalescing, on the leaves of *Syringa vulgaris*. This species is distinctive enough to be separated from the four other species of *Phyllosticta* which have been reported on this host, namely, *P. halstedii*, *P. syringicola*, *P. syringae*, and *P. syringophila*. *P. glycineum* causes the appearance on the leaves of soybean (*Glycine hispida*) of sub-circular, cinereous spots from 1 to 5 mm. in diameter, with a purple margin; the pycnidia are globose or somewhat applanate, 90 to 170 μ in diameter, immersed, with a slightly protruding ostiole 10 to 20 μ wide; the spores are

oblong, with rounded ends, continuous, hyaline to smoky, 2 to 2·5 by 4·5 to 7 μ. *P. avenophila* forms very extensive, cream-coloured to pale yellow spots on the leaves of oats; the pycnidia are numerous, spherical to slightly applanate, somewhat rostrate, 70 to 100 μ in diameter, with a round ostiole 10 to 15 μ wide; the rostrum is 15 to 20 μ high, 10 to 20 μ broad, and completely erumpent; the spores are hyaline, continuous, oval to elliptical, and 3 to 4 by 6·5 to 8 μ. *Macrophoma zeae* forms very extensive, irregular, tan-coloured spots, with a slightly darker margin, on the leaves of maize; the pycnidia are abundant, round to oval or even lenticular in cross section, spherical to applanate in long section, 65 to 120 μ in diameter, non-rostrate, with a protruding oval ostiole, 15 to 17 by 28 to 35 μ in diameter; the spores are continuous, hyaline to greenish, fusiform, and 6·5 to 8·5 by 17 to 31 μ.

In discussing the genus *Phyllostictina* as conceived by Sydow, von Höhnel, and Shear [*R.A.M.*, iii, pp. 104, 656; iv, p. 742], the authors state that the species now included in the genus may apparently be divided into two groups characterized generally as being pycnosclerotial but distinguishable as follows: Group 1. Sporophores absent, spores liberated through the histolysis of a pseudoparenchyma, pycnidia functioning soon after formation, and ceasing to function with the discharge of a single spore crop; this group includes *P. murrayae* Syd. and *Phyllosticta gymnocladi*, a new species recorded by them on *Gymnocladus dioica*, but stated to be morphologically a *Phyllostictina*. Group 2. Sporophores developing subsequent to the histolysis of a pseudoparenchyma, pycnidia functioning after a period of dormancy and then without mechanical limitation, spores provided with a mucous appendage; also normal *Phyllosticta* pycnidia functioning immediately after development; this group includes *P. solitaria*, and probably also *P. congesta*, *Phyllostictina uvicola*, *P. carpogena*, and *P. vaccinii*. In their opinion group 1 is equivalent to *Phyllostictina* Sydow. Group 2 requires further analysis, but could be placed in a genus based on the dormant pycnosclerotia or left in *Phyllosticta* on the basis of the non-dormant sporulation. Von Höhnel's emended *Phyllostictina* should be ignored, as it applies neither to the monotype nor to apparently related species. Further, the relations between imperfect fungi and Ascomycetes should not constitute factors deliminating genera in the Fungi Imperfecti, since morphology alone should furnish such distinctions.

TRANZSCHEL (V. A.). Краткий отчет о командировке в Крым в **1926** г. [Brief report of a special mission to the Crimea in 1926.]—*Отчет о Деят. Акад. Наук СССР за 1926 г.* [*Trans. Russian Acad. of Sciences in 1926*], 2, pp. 99–101, 1927. [Abs. in *Ann. State Inst. of Exper. Agron.*, Leningrad, v, 2–3, p. 231, 1927.]

During a special mycological mission to the Crimea in 1926 the author paid particular attention to various species of rusts occurring in that region. His observations on the yellow rust of cereals (*Puccinia glumarum*) lead him to believe in the possibility of a genetic relationship between this fungus and *Aecidium valerianellae* Biv. Unexpected results were obtained with *P. cynodontis*

Desmaz., which was shown to be polyphagous. He further succeeded in establishing the genetic connexion between *Caeoma ari* and a species of *Melampsora* on the pyramidal poplar [*Populus nigra* var. *pyramidalis*], and he therefore gives the latter the name *M. ari-populina*. The aecidia on *Inula germanica* were shown to belong to a new species of *Puccinia* on *Carex nutans*, which the author names *P. inulae-caricis*.

HIRATSUKA (N.). **Studies on the Melampsoraceae of Japan.**—Reprinted from *Journ. Faculty of Agric., Hokkaido Imper. Univ.*, xxi, 1, 40 pp., 2 graphs, 1927.

This is a taxonomic study of some of the Melampsoraceae of Japan, including full morphological descriptions of the species of *Melampsoridium* parasitic on Japanese species of *Alnus*; of *Thecopsora* on Japanese species of *Prunus* and Ericaceae; and notes on various species of *Pucciniastrum* and *Chrysomyxa*.

BUDDIN (W.) & WAKEFIELD (ELSIE M.). **Studies on Rhizoctonia crocorum (Pers.) DC. and Helicobasidium purpureum (Tul.) Pat.**—*Trans. Brit. Mycol. Soc.*, xii, 2–3, pp. 116–140, 4 pl., 1927.

The opinion expressed by the authors in their former paper [*R.A.M.*, iv, p. 247] that *Helicobasidium purpureum* is the perfect stage of *Rhizoctonia crocorum* was substantiated by the discovery in three widely separated localities of a fertile form of the former in very close association with a root rot characterized by 'infection cushions' of the latter on red clover [*Trifolium pratense*], *Mercurialis perennis*, and *Urtica dioica*. Morphologically, both fungi are exactly similar, their hyphae exhibiting the same type of branching, septation, and absence of clamp connexions. They also resemble one another in nuclear characters in that their cells are sometimes uni- but more often binucleate. Seven strains of *R. crocorum* obtained from various sources were compared with numerous spore isolations of *H. purpureum* as to cultural characters, considerable variations in colour and type of growth being noted in both fungi. Conidia of a *Tuberculina* type were frequently produced in cultures of *H. purpureum* and occasionally in cultures of strains of *R. crocorum* isolated from nettles and mangolds. Subcultures of *H. purpureum* sometimes developed strains which acquired the dark colour characteristic of the sterile strains of *R. crocorum*, and which afterwards remained sterile; a similar variation was noticed in the strain of *R. crocorum* from nettles, which at first only produced a pale growth with a tendency to form conidia.

Inoculation experiments on various legumes and carrots gave positive results, with the production of typical root rot, with four of the seven strains of *R. crocorum*, and with three dark-coloured strains of *H. purpureum* originating from specimens associated with red clover. Although no specialization in parasitism was noted in other strains of *R. crocorum*, none of those from *Urtica* produced any infection on clovers or carrots, the same also applying to *H. purpureum*.

In a discussion of the results obtained, the authors point out that the balance of the evidence is in favour of the genetic relationship

between the two fungi. The inconsistencies noted in the behaviour of the cultures may be due to the fact that the organism is very variable, and that not all the strains are equally parasitic. It must also be remembered that very little is yet known as to the conditions for infection with *R. crocorum*.

ASHBY (S. F.). **Macrophomina phaseoli (Maubl.) comb. nov. the pycnidial stage of Rhizoctonia bataticola (Taub.) Butl.**—*Trans. Brit. Mycol. Soc.*, xii, 2–3, pp. 141–147, 1 fig., 1927.

As a result of a careful morphological and cultural comparison [details of which are given] of the following material: a *Macrophoma* from a dry fruit of sesame (*Sesamum indicum*) from Uganda; Petrak's type of *Macrophomina philippinensis*; a *Macrophoma* on leaves of *Corchorus* sp. from Bengal [*R.A.M.*, ii, p. 260]; the type of *Macrophoma cajani* on living stems of pigeon-pea from Pusa; and specimens of *Macrophoma phaseoli* on bean stems from the United States [ibid., vi, p. 138], the author comes to the conclusion that all the fungi listed above are identical with the sclerotial fungus *Rhizoctonia bataticola*. He agrees with Petrak's suggestion that pycnidial forms devoid of stroma, and with long, thin-walled, elliptical spores that remain hyaline and continuous, should be included in the latter's genus *Macrophomina*, and suggests the new combination *M. phaseoli* with the following as synonyms: *Macrophoma phaseoli* Maubl., *M. corchori* Saw., *M. cajani* Syd. and Butl., *M. sesami* Saw., *Sclerotium bataticola* Taub., *Rhizoctonia lamellifera* Small, *R. bataticola* (Taub.) Butl., *Dothiorella cajani* Syd. and Butl., and *Macrophomina philippinensis* Petr.

The geographical distribution of this fungus is stated to be very wide, ranging from Formosa, the Philippines, India, Ceylon, East Africa, Palestine, and Egypt to the West Indies and the eastern United States, with a large range of hosts of considerable economic importance. The parasitism of the fungus appears to be much influenced by the effects of environmental and nutritional conditions on the host, and its restriction in Uganda to introduced plants is suggestive. In Formosa applications of wood ashes and lime have appreciably reduced losses in jute [ibid., iv, p. 36], and in India, on an acid soil, manuring with potash or ash of the water hyacinth (*Eichornia crassipes*) has markedly lessened attacks on the same host [ibid., iv, p. 350].

MASON (E. W.). **On species of the genus Nigrospora Zimmermann recorded on monocotyledons.**—*Trans. Brit. Mycol. Soc.*, xii, 2–3, pp. 152–165, 1 pl., 1927.

In this paper an attempt is made to bring together a number of congeneric species of black-spored fungi which have been, at various times, recorded on monocotyledons and classified in diverse genera.

The genus *Basisporium*, with the species *B. gallarum*, was described and figured by Molliard in May, 1902, from a fungus with spores 14 by 11 μ growing on dead larvae of *Lipara lucens*. Since, however, in February, 1902, Zimmermann in Java had established the genus *Nigrospora*, describing *N. panici* growing on the leaves of *Panicum amphibium* which, judging from his

description and figures, was a typical *Basisporium* with very large spores (25 to 30 by 22 to 25 μ), and as, moreover, a culture labelled *Nigrospora panici*, isolated by Kuyper, was found also to be a typical *Basisporium* but with smaller spores than Zimmermann's measurements, the present author accepts *Nigrospora* as the correct generic name for these fungi.

Two isolations from West Indian banana plants gave the same species of *Nigrospora* with spores having a long diameter of 16 to 18 μ. The species determined by Ashby in 1913 as *Acremoniella occulta* Cavara on banana and coco-nut leaves in Jamaica was found to be a *Nigrospora*, the spore length being 13 to 15·5 μ, and a culture of *Nigrospora* isolated from sugar-cane in Mauritius showed spores with a long diameter of 13 to 15 μ. Each of these two organisms remained constant in culture, and the same two strains were also found on maize and rice. The earliest record for the small spore strain is apparently *Monotospora oryzae* B. and Br. on rice from Ceylon in 1873. This fungus was renamed *N. oryzae* by Petch in 1924, and this name is accepted by the author. The large spore strain was first recorded as *Trichosporium sphaericum* by Saccardo in 1882 on maize culms from the United States and this species is transferred by the author to the genus *Nigrospora* as *N. sphaerica*.

From a critical examination of a large number of type and other specimens the author has provisionally determined the following synonymy of these two organisms. *N. oryzae* was named in 1873 *Monotospora oryzae* by Berkeley and Broome as mentioned above, *Memnonium palmicolum* by Cooke in 1877 on coco-nut leaves from British Guiana (this name was changed later to *Trichosporium* (Cke) Sacc.), *Acremoniella occulta* by Cavara in 1893 on wheat culms from near Florence, Italy, *Basisporium gallarum* by Molliard in 1902; and, judging from the figure and diagnosis, *Glenospora elasticae* by Koorders in 1907 on *Ficus elastica* from Java. The fungus named *Sporotrichum maydis* by Garovaglio in 1873 on maize in Italy (later renamed *Trichosporium maydis* by Saccardo) cannot with certainty be referred to *Nigrospora* as no type material exists, but it may have been identical with *N. oryzae*.

N. sphaerica was named *Trichosporium sphaericum* Sacc. in 1882, *Hadrotrichum arundinacearum* Cke and Massee in 1887 on *Arundo conspicua* at Kew, *Epicoccum levisporum* Pat. in 1893 on sugar-cane from San Nicolas, South America, *E. hyalopes* Miyake in 1910 on rice in Japan (also recorded by Butler on rice in India and by the present author for Uganda), *Coniosporium gečevi* Bubák in 1912 on maize from Bulgaria, and *C. extremorum* Sydow in 1913 on sugar-cane leaves from the Philippines.

In addition, Morgan in 1895 founded *Monotospora nigra* for a fungus on maize stalks in Ohio, the description of which suggests a *Nigrospora*, while Jensen in 1912 identified the same fungus from the soil of maize fields at Cornell and transferred it to the genus *Mycogone* as *M. nigra*. The author was unable to obtain information about either of these collections, but on account of the spore lengths (given as 14 to 18 μ and 13 to 15 μ, respectively), he suggests that the former may have been *N. sphaerica* and the

latter *N. oryzae*. *Coniosporium micans* recorded by Gaja as a new species on *Gynerium* in 1912 in Italy is thought probably also to be a species of *Nigrospora*.

Glenospora sacchari, described by Spegazzini in 1896 on sugar-cane in Tucumán, La Plata, with spores 20 to 22 by 15 to 18 μ, is stated from examination of the type to be a large spored *Nigrospora* and is transferred to this genus as *N. sacchari* comb. nov.

In addition to the above, there are unchecked records of *Basisporium gallarum* by Heald and Poole in the United States in 1909, on tomatoes by Ramsey in the United States in 1922, and on sugar-cane, *Panicum barbinode*, and *Eriochloa subglabra* by Johnston and Stevenson in 1917; *N. oryzae* was received on wheat from Peyronel in Italy in 1926 and has been found by the author on rice from the Gold Coast and the Philippines (in the latter case included in an exsiccatum of *Coniosporium oryzinum* Sacc.).

The fungus tentatively identified as *Basisporium gallarum* by Miss Dale in 1912 was found to be quite a distinct organism from those here discussed.

KUYPER (J.). **Het verband tusschen slijmziekte en voorafgaande begroeing in de proef op Padang Boelan.** [The connexion between slime disease and the previous crop in the experiment at Padang Boelan.]—*Deli Proefstat. te Medan* [*Sumatra*] *Vlugschr.* 41, 5 pp., 1927.

Of the sixteen plots planted with tobacco at Deli (Sumatra) in 1927 to test the effect of the preceding crop on the incidence of slime disease [*Bacterium solanacearum*: *R.A.M.*, vi, p. 390], ten had lain fallow since 1915 and the remainder since 1924. The lowest amount of infection (3 per cent.) occurred on a plot previously planted with pure *Mimosa invisa* [ibid., iv, p. 638] and left fallow for twelve years. The incidence was also low (6, 8, and 9 per cent.) on plots following *Mimosa* mixed with a natural secondary growth. The highest percentages of infection (35, 36, 37, and 38) were found on plots following natural wild growth, *Tectona grandis*, *Albizzia falcata*, and *Leucaena glauca*. In all cases the disease was more severe on the plots which had only lain fallow for 2½ to 3 years as compared with the longer period.

JOCHEMS (S. C. J.). **Parasitaire stengelverbranding bij Deli-Tabak.** [Parasitic stem scorch of Deli Tobacco.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, xlix, 35 pp., 4 pl., 1927. [English summary.]

This is an expanded account of the author's investigations of stem burn or stem scorch of Deli tobacco associated with various species of *Pythium* (including *P. de Baryanum* and *P. aphanidermatum*), the main features of which have already been noticed [*R.A.M.*, vi, pp. 444, 445]. It is pointed out that heavy financial losses are incurred by the necessity of replanting infected fields at a high cost, and by the consequent irregularity of growth and differing times of maturity, which prevent simultaneous harvesting of the whole crop.

SOROKIN (HELEN). **Phenomena associated with the destruction of the chloroplasts in Tomato mosaic.**—*Phytopath.*, xvii, 6, pp. 363–379, 4 pl., 1927.

This is a detailed account of the author's observations on the disintegration of the chloroplasts in tomato mosaic [*R.A.M.*, v, p. 453]. Sections of living material, mounted in water, showed that some of the numerous, apparently healthy chloroplasts occupying the cells of the transitional zone between the green and chlorotic regions of mosaic leaves contained stationary hyaline bodies, surrounded by a halo and measuring about 2 μ in length. In certain other chloroplasts the halo was absent and the bodies were revolving actively. Viewed from one side, the bodies resembled elongated crystals with one edge somewhat pointed and the other slightly rounded. A definite black stripe, connecting two small black points, extended along the long axis of the bodies, some of which showed a cap-shaped structure adherent to their whole length. Spherical transparent vesicles were attached to the chloroplasts containing the hyaline motile bodies. These spheres [loc. cit.] reach 8 to 10 μ in diameter after the complete disappearance of the chloroplast and they then contain from 5 to 8 or occasionally as many as 15 hyaline moving bodies within each. The spheres give negative protein reactions and are insoluble in alcohol, acetone, or acids. They are soluble in weak alkali and can be stained lavender with a dilute aqueous solution of gentian violet, which imparts a dark purple tinge to the chloroplasts.

The following hypothesis is put foward to explain the changes in the chloroplasts. The movement of the hyaline bodies within the normally rather solid chloroplast is possible only after the liquefaction of its stroma by a proteolytic enzyme, perhaps secreted by an organism, though whether the hyaline bodies represent such an organism it is impossible to say. An increased osmotic concentration results within the chloroplast and water is taken in from the surrounding medium. Finally all the body of the chloroplast goes into solution and the sphere appears, probably representing a 'membrane' resulting from the digested chloroplast in which the digested products and water are retained, the whole being surrounded by a film at the interface.

In cells of mosaic tomato leaf devoid of normal components hyaline bodies were observed which moved with great rapidity. Some of these bodies were almost identical with those found in the spheres but others were much larger (from 2 to 5 μ), more irregular in shape, and more sensitive to certain chemicals.

A third type of moving body was found in abundance in the hair cells. These are very similar to the hyaline bodies but are not green reflecting. They exhibit a very intensive movement, but after a time the whole mass was observed to become surrounded by a halo of clear cytoplasm and the movement stopped. The granular substance reported by several authors is thought probably to have been a mass of these fixed bodies.

The intracellular bodies reported by Kunkel [ibid., iii, p. 598], Smith [ibid., iii, p. 538], Goldstein [ibid., vi, p. 260], McKinney, Eckerson, and Webb [ibid., iii, p. 452], and others are said to be quite definitely associated with the mosaic disease and are thought

possibly to represent one stage in the life-history of an organism. The striate material described by several investigators has never been observed in living cells, and by fixing material under the microscope it is possible to observe the transformation of crystals, the presence of which is very typical in cells containing intracellular bodies, into striate material, especially when picric acid is used.

The author draws attention to certain resemblances between the spheres described above and the polyhedral bodies of Lepidopterous larvae. In the present stage of our knowledge it is quite impossible to state whether the hyaline bodies are real organisms or simply by-products of an organism, but the author regards the disease as caused by an organism of the chlamydozoon type, with properties corresponding very closely to those of Chlamydozoa, Strongyloplasma, and Rickettsia, a conclusion which is considered to be of great significance as it links up the mosaic type of disease in plants with the animal virus diseases.

LUSTNER (G.). **Der Tomatenkrebs.** [Tomato canker.]—*Obst- und Gemüsebau*, lxxiii, 11, pp. 166–167, 1 fig., 1927.

A brief, popular description is given of the symptoms and life-history of the fungus responsible for tomato canker (*Didymella lycopersici*), which caused very heavy damage in the environs of Hamburg in 1919 [*R.A.M.*, i, p. 48]. The source of infection is the dead foliage, which should be destroyed immediately after the harvest. At the same time the soil should be limed and ploughed up in order to kill any remaining spores. The greenhouses should be well ventilated and the plants kept as dry as possible. Spraying the plants with uspulun has given good results, but this preparation is liable to impart an unpleasant taste to the fruit, and after the latter has set should be replaced by solbar. All the tomato varieties cultivated in the affected localities, viz., Holländische Traubentomate, Lucullus, Sunrise, Alice Roosevelt, and Dänischer Export showed an equal degree of infection.

DOUIN (M.) & GOLDMACHER (N.). **Quelques maladies épidémiques des jeunes plantes dans les pépinières des forêts.** [Some epidemic diseases of seedlings in forest nurseries.]—*Actes 1er Congr. Internat. de Sylvicult.*, v, pp. 284–298, 5 figs., 1926. [Abs. in *Bot. Centralbl.*, N.F., xi, 3–4, p. 126, 1927.].

A wilt disease of pine seedlings is stated to cause heavy losses in forest nurseries of the Moscow district. Various species of *Fusarium* related to *F. herbarum*, *F. caudatum*, and *F. subcarneum* are believed to be implicated in the etiology of the disease, which was formerly attributed to *F. blasticola* Rostr. alone. *F. venenerum* Doun. and bacteria may also be involved. The wilt disease is transmissible by the seed, and mixed infections are common in nature. The spread of infection cannot be arrested by maintaining a considerable distance between the beds.

TIEMANN (H. D.). **Mortality among Oaks.**—*Quart. Journ. of Forestry*, xxi, 3, pp. 225–227, 1927.

With reference to Robinson's and Osmaston's papers on the

mortality of oaks in England [*R.A.M.*, vi, p. 198], the author describes a peculiar dying of species of red and black oaks (chiefly *Quercus velutina* and *Q. maxima* of the Erythrobalanus group) which is occurring on a large scale throughout the Lake States in the United States. The outstanding feature of the trouble is that often the affected tree dies quite suddenly, without any preliminary indications of disease, and frequently as many as one hundred trees perish in the course of four or five years on an area of less than one acre. Usually such trees come into leaf normally in the spring, but later in the season the leaves seem to be affected by drought, turn yellow in less than a month, and fall. Occasionally one or two branches may bear leaves in the following season, but most frequently the tree dies completely in a few weeks' time. The cause of the disease has been ascribed to *Armillaria mellea*, which no doubt ultimately attacks the roots in many cases, but examination of the roots and timber of newly affected trees failed to reveal the presence of this fungus. There are indications that the trees growing on areas where the leaves have been burnt around the roots are more liable to die than those growing in the untouched forest, and the author tentatively suggests that the trouble may be due to the upsetting of some biological factor, possibly a change in the acidity of the soil, brought about by the burning of the leaves around the trees.

EFTIMIU (PANCA). **Contribution à l'étude cytologique des Exoascées.** [Contribution to the cytological study of the Exoascaceae.]—*Le Botaniste*, Sér. xviii, 1–6, pp. 1–154, 3 pl., 38 figs., 1927.

Full particulars are given of the writer's extensive morphological and cytological studies of the following species of Exoascaceae: *Taphrina aurea*, *T. alni-incanae*, *T. bullata*, *T. deformans*, *T. betulae*, *T. pruni*, *T. crataegi*, and *T. insititiae*.

The cells composing the subcuticular or intercellular hyphae of these species are generally binucleate. Fusion of the nuclei occurs just prior to the formation of the asci, which arise by the outgrowth of a papilla from the cells containing the fusion nucleus. This papilla penetrates the cuticle and its upper two-thirds becomes the ascus, the lower part forming an empty basal cell. In some species (e.g., *T. alni-incanae*) no basal cell is formed. By three successive divisions of the nucleus in the ascus the eight nuclei of the ascospores are formed. There are two chromosomes in the haploid and four in the diploid stages.

The ascospores germinate in the ascus, or after liberation, by the emission of a bud which receives a nucleus from the mother-spore. This nucleus divides and gives rise to the binucleate condition. No mention is made of conjugation between the yeast spores [*R.A.M.*, vi, p. 586].

The action of these parasites does not at first cause the death of the host cells, which retain their nuclei and may continue to grow for a time. In most cases the stimulatory action exercised by the fungus on the parenchymatous tissues of the host causes the elongation and tangential or occasionally vertical division of the cells, resulting in hypertrophy. The intercellular spaces are

reduced or eliminated by this cellular hypertrophy, and eventually all differentiation between palisade and mesophyll tissue disappears in affected leaves. At the same time the plant exhibits a marked thickening of the cell walls.

Under the action of the parasite, the chloroplasts are completely transformed into amyloplasts. At a certain stage in the development of the infection the starch disappears from the cells, being probably utilized by the fungus. The spherical cytosomes of the healthy cell are also modified by parasitic action, sometimes assuming a vesicular form or more often becoming rod-shaped, and gradually losing their chromatin. *T. aurea* was further observed to utilize the oil drops occurring in the infected cells of the leaf tissue of *Populus nigra* for its nutrition.

EFTIMIU (PANCA). **Étude cytologique sur la famille des Exoascées.** [A cytological study of the Exoascaceae.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 2, pp. 166–175, 1927.

This article summarizes the author's researches described in the preceding abstract.

WILSON (M.). **The host plants of Fomes annosus.**—*Trans. Brit. Mycol. Soc.*, xii, 2–3, pp. 147–149, 1927.

The author states that *Pinus laricio*, *Abies nobilis*, and *A. pectinata* must be added to the list of hosts of *Fomes annosus* recorded in Great Britain by Anderson [*R.A.M.*, iii, p. 494], and that probably all coniferous species may eventually prove to be susceptible. Practically all the conifers introduced from America have been severely attacked by the disease, while in America the fungus is not common and its economic importance does not seem to be great.

The distribution of *F. annosus* on dicotyledonous trees and shrubs in Scotland appears to be fairly similar to that in France, Germany, and Denmark, its host range including *Alnus glutinosa*, *Betula alba*, *Corylus avellana*, *Crataegus oxyacantha*, *Fagus sylvatica*, *Prunus padus*, *Pyrus aria*, *P. aucuparia*, and *Rhododendron ponticum*. The occurrence of the fungus on dicotyledonous trees such as the oak and the birch may explain the frequent appearance of the disease when scrub areas covered by these species are cleared and planted with conifers.

DAY (W. R.). **A leaf-cast of the Douglas Fir due to Rhabdocline pseudotsugae Syd.**—*Quart. Journ. of Forestry*, xxi, 3, pp. 193–199, 5 figs., 1927.

This is a brief account, compiled for the most part from the descriptions of Wilson [*R.A.M.*, vi, p. 702] and of Weir (*Journ. Agric. Res.*, x, p. 99, 1917), of the leaf cast of the Douglas fir (*Pseudotsuga taxifolia*) caused by *Rhabdocline pseudotsugae*, which was recorded for the first time in 1922 in Scotland, since when it has also been found in four southern counties of England, namely Berkshire, Hampshire, Kent, and Surrey. It is believed, however, that it is much more widely spread than this in Great Britain. Although Wilson considered the green Douglas fir (*P. douglasii*) free from the disease in England, in the spring of 1927 the present

author received branches of this variety very severely infected but showing relatively few fructifications of the fungus; since then two further cases of mild infection have been discovered in the proximity of severe infection centres in the blue (*P. glauca*) and intermediate (*P. douglasii* var. *caesia*) varieties.

The author doubts the practicability of eradicating the disease by destroying infected trees and spraying the surrounding ones, as attempted in Scotland and Hampshire, and considers that control will probably be achieved rather by the adoption of suitable silvicultural methods. The view is expressed that there can be little doubt of the disease having been introduced from North America with infected trees.

BECKER (A.). **Pilzliche Bauholzzerstörer, ihre Verhütung und Bekämpfung.** [Fungi destructive to constructional timber, their prevention and control.]—Reprinted from *Tageszeit. für Brauerei*, Supplement 124, 4 pp., 7 figs., 29th May, 1927.

A brief account is given in popular terms of the damage caused in Germany by wood-destroying fungi, chiefly dry rot (*Merulius domesticus*) [*M. lacrymans*], *Coniophora cerebella*, and *Polyporus vaporarius* [*Poria vaporaria*], the life-histories and mode of infection of which are concisely outlined. Notes are given on the legal aspect of dry rot and on the prevention and control of the damage caused by the above-mentioned organisms.

HOWALD (A. M.). **Penetrance of oily fluids in wood. Neglected factors influencing penetration and absorption of creosotes, petroleum oils and creosote-petroleum mixtures.**—*Chem. & Metall. Engin.*, xxxiv, 6, pp. 353–355, 1 fig., 1927.

The author's investigations [details of which are given] have shown that, contrary to accepted ideas, viscosity is not always the primary factor in the penetration of timber by the creosotes, petroleum oils, and creosote-petroleum mixtures used as preservatives. For instance, in the case of two oils of approximately equal absolute viscosity, the average absorption in matched 6 by 6 by 30 in. Douglas fir [*Pseudotsuga taxifolia*] blocks was 1·40 lb. per cu. ft. in a four-hour treating period for one, and 12·94 lb. per cu. ft. for the other. These differences were just as marked when measured visually as when calculated by the net weight of absorption. Other examples are cited showing the absence of correlation between viscosity and penetration.

MOLL (F.). **Einige Beobachtungen der Imprägnierungstechnik über die Fortleitung von Flüssigkeiten im Holz.** [Some observations of impregnation technique in the diffusion of fluids in wood.]—*Zeitschr. Angew. Chem.*, xl, 21, pp. 583–585, 1 fig., 1927.

Particulars are given of various tests applied to treated wood to ascertain the extent of diffusion of the fluid preservatives, with special reference to the Cobra process [*R.A.M.*, v, p. 589]. The so-called lead and alizarin tests are described. In the former the wood is dipped in a solution of lead chloride, which reacts with the sodium fluoride to form an insoluble lead fluoride; this is converted

by ammonium sulphide into black lead sulphide. In the second, a fresh solution of zirconium-alizarin-sulphate turns from magenta to bright yellow on contact with sodium fluoride.

The use of impregnation processes based on osmosis and dialysis is briefly described, but so far the results obtained by these methods are stated not to equal those secured by pressure in closed cylinders.

FLACHS. **Gelegenheitsschmarotzer an gärtnerischen Kulturpflanzen.** [Facultative parasites on cultivated garden plants.]—*Blumen- u. Pflanzenbau*, xlii, 13, pp. 194–195, 2 figs., 1927.

Brief, popular notes are given on three Myxomycetes which, though not true parasites, may cause considerable damage to garden plants. *Spumaria alba* [*Mucilago spongiosa*] forms a snow-white to bluish-green, viscous mass on clover, cucumbers, and other plants, in damp frames. Its spores, which measure 10 to 15 μ, are deep purple in transmitted light and furnished with an echinulate membrane. *Physarum gyrosum* covers the leaves of plants in propagating frames and hothouses with a leaden-coloured to yellowish-white slime. The fruit bodies are vermiform, irregular, or rosette-shaped. This organism caused severe injury to asparagus at Munich in 1924. *Didymium anellus*, which does not appear to have been previously recorded in Germany, produces a hyaline, later yellowish, slime. Its purplish-brown, echinulate spores measure 7 to 11 μ. Lettuce plants affected by this organism show a slight discoloration and curling of the leaves.

NELSON (R.). **Storage and transportational diseases of vegetables due to suboxidation.**—*Michigan Agric. Exper. Stat. Tech. Bull.* 81, 38 pp., 8 pl., 1926. [Received September, 1927.].

This bulletin describes an investigation of certain non-parasitic diseases of cabbage, lettuce, and potato, attributed to unsatisfactory conditions during storage and transit.

The 'black leaf speck' disease of cabbage, cauliflower, and other crucifers has been known in Michigan for many years and has also been observed on consignments from the south. It is characterized by innumerable, depressed specks of variable shape and size but averaging less than 0·5 mm. in diameter, and from lead-grey to black in colour, which occur singly or in clusters over the entire leaf surface, in severe cases even the heart leaves being affected. Whole consignments may, in consequence, become unsaleable. No organism could be isolated from diseased material or demonstrated microscopically in the tissues. The condition is distinguished from ring spot (*Mycosphaerella brassicicola*) and from black leaf spot (*Alternaria brassicae*) by the sunken character of the lesions, and their irregular outline. It can also be distinguished from McCulloch's cauliflower spot (*Bacterium maculicolum*) by the fact that, in the latter, infection takes place through the stomata.

The disease of lettuce designated by the author as 'redheart', seldom attains major importance during transit, but develops after the lettuces have been placed on the market. It is said to attack most frequently the solid-headed varieties, and to be most severe in late winter and early spring. Cabbages in transit are also

affected by the same disease. In the case of lettuces, the heart leaves are a deep chestnut-brown, and in that of cabbages, a typical red colour. The outer leaves may show 'black leaf speck' and may, in lettuces affected with redheart, develop numerous pits in the midribs, veins, or in the parenchyma between the veins. These pits are brown, small, usually elongated, with their longer axis parallel to the midrib.

The disease of potato known in the trade as 'button rot' has become increasingly prevalent during the past few years, and in 1923 losses of from 25 to 30 per cent. were not uncommon in Michigan. It is characterized by shallow surface pitting of the tubers, caused by the death and subsequent desiccation of certain areas of the cortical and adjacent cells. When the condition is severe, secondary attacks of fungi, mostly species of *Fusarium*, may be observed. In the initial stages the pits are usually small, the surface is hard, and the margins fairly regular in outline and of a greyish-blue colour. There may be browning of the flesh beneath the pits, but these bear no relation to the lenticels; blackheart [*R.A.M.*, v, p. 626] may also be present.

Experiments [which are described in detail, and the results of which are tabulated] were conducted to ascertain the effects of some or all of the following factors in producing these diseases during storage: temperature, ventilation, duration of storage, movement of air, and volatile substances other than carbon dioxide given off. It was found that black leaf speck of crucifers, redheart of lettuce, and the surface pitting of potato tubers could all be reproduced experimentally under various conditions of temperature and air composition. The author concludes that these diseases are caused primarily by an inadequate supply of oxygen, or by temperatures low enough to prevent the utilization of the oxygen present in the storage atmosphere. Air movement without renewal did not prevent breakdown, and low temperature was more important in producing the disease than the composition of the air at such temperature. Surface breakdown of potato tubers was produced by storage conditions less severe than those required to induce blackheart. It is suggested that the ultimate cause of these diseases is the liberation or accumulation in certain cells of some toxic fragment resulting from the mixing of a hydrolytic enzyme and glucoside.

Control consists in adequate ventilation of stored vegetables and in maintaining an average storage temperature of from 3° to 5° C.

NAOUMOFF (N. A.). Действие кальция и некоторых других металлов при заражении Капусты килой. [Effect of calcium and certain other metals on the infection of Cabbage with club-root.] —*La Défense des Plantes*, Leningrad, iv, 2, pp. 320–328, 1 graph, 1927.

The purpose of this investigation [details of which are given] was to establish whether the well-known controlling effect of hydrated lime, when applied to the soil, on the infection of cabbage with club-root [*Plasmodiophora brassicae*] is due to a direct action of the calcium salt on the parasite, or indirectly to its immunizing effect on the host, and whether it is specific to calcium

compounds or common to other metals. The results of experiments in which cabbage seedlings were raised and grown for two months in soil with a high lime content (2 gm. freshly slaked lime per 100 c.c.) and then transplanted to infected soil, showed that such seedlings were as susceptible to infection as the controls, thus indicating that lime had no effect on them, and that its controlling effect must be explained by a direct action on the parasite. Another series of experiments in which various salts of other metals (mostly bivalent) were tested parallel to calcium salts, showed that the controlling effect on *P. brassicae* is not specific to calcium, but is also possessed by other metals, particularly by magnesium and barium. The deciding factor in the inhibitory action of the salt on the parasite is not so much the nature of the metallic ion as the presence of free hydroxyl ions in the substratum. Of great importance is also the form under which the metallic compounds are introduced into the soil, as the less soluble and more stable compounds were shown to possess a more durable and constant action.

SOLBERG (LOUISE). **Notis om de nyeste resultater av undersøkelserne over Ertenes visnesyke.** [Note on the latest results of the investigations on wilt disease of Peas.]—*Nordisk Jordbrugsforskning*, pp. 306–307, 1927.

The writer has for some time been in doubt as to the importance of *Aphanomyces euteiches* in the causation of the wilt disease of peas in Norway [*R.A.M.*, vi, p. 388], since in some cases the presence of the fungus could not be demonstrated, while other plants heavily infected by the fungus throve almost equally with the controls. Recent investigations indicate that the disease is primarily due to another organism, probably a species of *Polyangium*, which completely destroyed the plants in nutrient cultures. The growing-point and flowers were atrophied, the leaves turned greenish-yellow, and the roots became brown, limp, and permeated by the organism and its cysts.

The organism penetrates the roots, though it appears to find great difficulty in traversing the epidermis and endodermis. The contents and walls of infected cells assume a golden-brown colour, which in wilted plants extends to the vessels: these contain golden-brown, highly refractory masses, insoluble in water. Presumably the pathogenic action of the myxobacterium is due to a toxic enzyme penetrating the vessels and travelling upwards with the sap stream, causing infection of the meristematic tissues, and finally of all the others.

The life-cycle of the organism is unusual. The polyhedric cysts, 10 μ in size, germinate by the emergence of the contents as an amoeboid mass, which divides into rod-shaped, motile myxobacteria, measuring about 0·5 by 2 μ; these rapidly multiply by division, forming zoogloeae and cysts, the latter developing in 14 to 21 days.

Decreto del C. Presidente de la Republica, que establece la Oficina para la Defensa Agricola. [Decree of the President of the Republic establishing the Office for Crop Protection.]—*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, i, 1, pp. 2–3, 1927.

By this decree of the President of the Republic of Mexico, dated

25th January, 1927, an Office for Crop Protection in San Jacinto, D.F., is established as from 1st January of the same year. It will take over the functions formerly carried out by the Commission for the control of locusts and, in addition, those that may be entrusted to it by the Mexican Secretariat for Agriculture in accordance with existing or future legislation for the control of crop pests and diseases. It will also publish a monthly bulletin, of which that in which the decree is published is the first issue.

Legislative and administrative measures. Dutch East Indies.—*Internat. Bull. of Plant Protect.*, i, 5, p. 77, 1927.

As from 15th November, 1926, live plants or parts thereof, fruits, and seeds exported from all foreign countries (including Holland) to the Dutch East Indies must be accompanied by a duly authenticated certificate of freedom from diseases and insect pests. Potatoes from Holland, Germany, Belgium, Poland, the British Isles, the United States, and Canada must also be accompanied by a certificate vouching for their freedom from wart disease (*Synchytrium endobioticum*) and stating that they were cultivated at a distance of at least 500 m. from infected tubers.

The importation from South American countries of plants or parts thereof (including the seeds) of *Hevea brasiliensis* is prohibited.

Order in Council. Declaring additional diseases under the Orchard and Garden Diseases Act, 1908, and extending the second schedule of the Act to include the said diseases.—*New Zealand Gazette*, 45, 1927.

By this Order in Council, dated 4th July, 1927, the following diseases are scheduled for the purposes of the Orchard and Garden Diseases Act, 1908 [which prohibits the introduction of plants infected with scheduled diseases into New Zealand and regulates the measures to be taken against outbreaks of such diseases in that country]: fusarial diseases (*Fusarium* spp.), mosaic diseases, powdery scab [of potato] [*Spongospora subterranea*], and stem wilt [of potato] (*Bacillus solanisaprus*) [*B. atrosepticus*].

Decreto que prohibe la entrada de la Papa extranjera atacada por plagas. [Decree prohibiting the entry from abroad of Potatoes attacked by pests and diseases.]—*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, i, 2, pp. 66–69, 1927.

This decree, dated 16th June, 1927, prohibits the importation of potatoes into Mexico except from countries which are free from potato wart disease (*Chrysophlyctis endobiotica*) [*Synchytrium endobioticum*] and other diseases [unspecified] not known to occur in Mexico or only to a limited extent, and which also maintain an adequate quarantine service. In each case a special permit of importation must be obtained from the Mexican Office for Crop Protection, and each consignment must be accompanied by duly attested certificates of health from the competent authorities in the exporting country, and by Mexican consular certificates attesting the freedom of the producing region from such pests and diseases.

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